APRIL 1960

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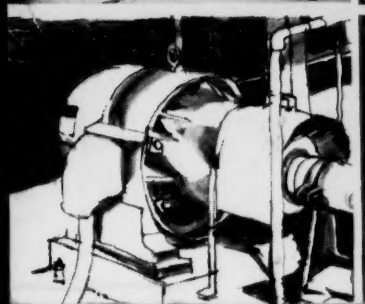
IN THIS ISSUE:

Saves with smaller, lighter V-belt ..... page 15
NEW FEATURE: Catalogs for your file ..... page 40

PLUS many more news reports of new developments, new literature and new solutions for making your plant and power services operation more efficient

Plant and Power Services Engineer

The NEWS Magazine for men who engineer and manage plant facilities



Taking the Modern Approach to Plant Services

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PNEUMATIC MATERIALS CONVEYING BY

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The positive pressure conveying system illustrated below is a page from our *new* Pneumatic Materials Handling Bulletin, PM-1. This is a system we engineered to deliver pellets from storage to a multitude of individual machine hoppers for continuous feeding into process.

If you are interested in investigating the advantages of conveying materials by air, we would like to send you a copy of this *new* bulletin. It pictures systems we've engineered and points the way to help in solving many of the materials handling problems of your plant and your materials.

THE ALLEN-SHERMAN-HOFF COMPANY pioneered in the field of materials handling systems—both pneumatic and hydraulic. Today we have systems in operation throughout the world, primarily in plants *where reliability of performance is of paramount importance.*

Discuss your materials handling problems with an A-S-H Representative—he's a pneumatic conveying expert. If there is any question about conveying your material, he'll arrange to have evaluation tests conducted by our Research Group. For his name and your copy of Bulletin PM-1, write, wire or phone . . .

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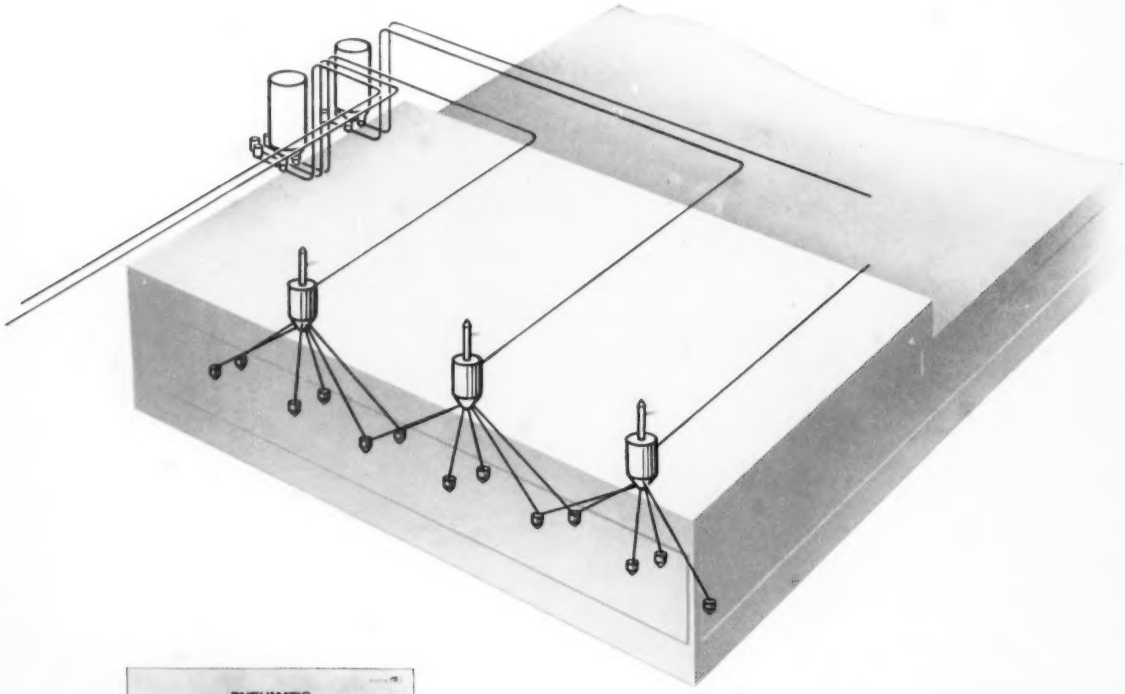


Our new Bulletin PM-1 points the way to Pneumatic Materials Handling for your plant and your materials. It's free for the asking.

For more information, circle 9324 opposite back cover.

CONVENTIONS AND EXHIBITS

Apr. 4-8: Annual Nuclear Engineering and Science Conference; New York Coliseum, New York, New York.

Apr. 5-7: Electrical Show for Industry; Cleveland Public Hall, Cleveland, Ohio.

Apr. 18-19: Joint Conference on Automatic Techniques; Sheraton Hotel, Cleveland, Ohio.

Apr. 25-26: ASME Maintenance and Plant Engineering Conference; Chase-Park Plaza, St. Louis, Missouri.

Apr. 25-29: ASME Metals Engineering Division-AWS Conference; Biltmore Hotel, Los Angeles, California.

May 1-4: Air Conditioning and Refrigeration Institute (Board and Annual Meeting); The Homestead, Hot Springs, Va.

May 3-5: Purdue University Industrial Waste Conference; Memorial Union Building, Lafayette, Indiana.

May 16-20: National Fire Protection Association Annual Meeting; Montreal, Canada.

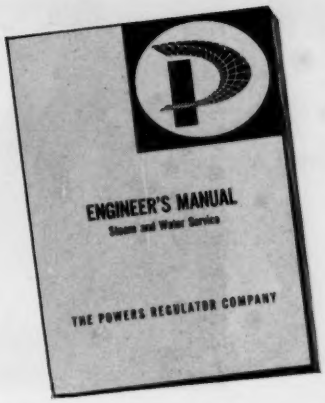
May 22-26: ASME Oil and Gas Power Conference and Exhibit; Muehlebach, Kansas City, Mo.

May 23-26: ASME Design Engineering Conference and Show; Statler Hilton, New York, N.Y.

June 6-9: Annual Meeting of National District Heating Association; Grove Park Inn, Asheville, North Carolina.

June 6-17: John Hopkin's Management Course in Operations Research & Systems Engineering; Homewood Campus of John Hopkins University, Baltimore, Md.

June 20-22: ASME Applied Mechanics Conference; Pennsylvania State University, University Park, Pennsylvania.



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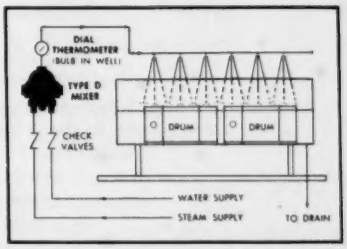
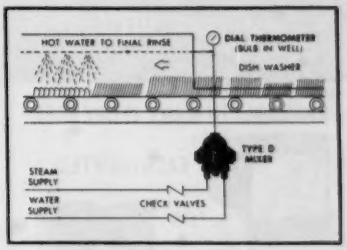
How To Maintain Uniform Process Hot Water Temperature





Schematics above show the function of Powers Type D Mixer in standard systems for maintaining uniform process hot water temperature where it is not practical to install or use a steam heated storage tank. These drawings are taken from the Powers *Engineer's Manual, Steam-Water Service* which is free to you for the asking. Each drawing is supplemented with detailed engineering information about the controls used. Everyone concerned with the installation and/or operation of steam-water service will find these diagrams a helpful guide in laying out a new system or updating an existing one. Other sections offer similar easy-to-follow diagrams and concise details on the following:

- Domestic Hot Water
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- Instantaneous Heat Exchangers
- Heat Exchangers For Cooling
- Fuel Oil Heaters
- Pressure Reducing
- Jacket Water Cooling
- Two-Temperature Hot Water Systems

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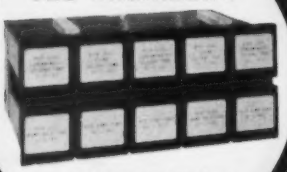

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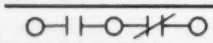

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Circle 9326 opposite back cover.

Specifically speaking

With today's growing technology, many opportunities are available to plant and power services engineers for making their operations as modern as possible. Our feature stories, this month, point out three ways to take this modern approach—through the application of MODERN IDEAS, through the MODERNIZATION of existing facilities, and through the use of MODERN MATERIALS.

The MODERN IDEA concept is very evident in the new Administrative and Research Center, International Minerals & Chemicals Corp. has just completed. In space heating and cooling, a combination radiant-and-air system is proving to be "tops" in performance.

MODERNIZATION of electrical distribution systems to handle the increased load demands that result from modernization of plant's production operation is happening in quite a few plants around the country. A good example of how this can be accomplished is at the Washington, D.C., Post Office, whose recent mechanization program rivals that of any industrial plant.

A good example of how MODERN MATERIALS can work for you can be found in the story starting on page 22. By rewinding and silicone-insulating old motors, numerous savings are realized because the motors are able to handle 30 to 50 percent higher loads at improved power factors.

SAFEGUARDING is our theme next month. Some stories along this line tell "How to get scientific shaft alignment" and "How to detect vibration caused by malfunctions before serious damage can occur."

George V. Michael

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Plant Power Services Engineer

Serves the professional, technical and practical interests of the engineers who design, install, maintain and/or operate the plant engineering services and the power engineering services.

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24 Sound traps put prison 'grapevine' into confinement
25 Cast aluminum bus bar racks up 65% saving
26 Liquid-level controls that are non-metallic
30 Pre-packaged fired heaters are easy to install
31 Gives longer cement lining life to equipment
32 Low-cost capacitors correct power factor

PLUS lots of other news for plant and power services engineers

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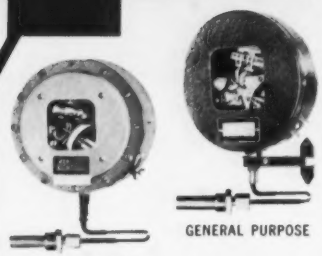

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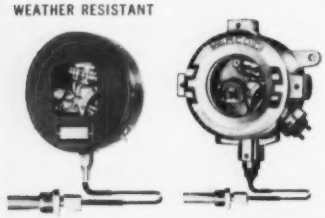

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REPORTS IN BRIEF

Abstracted news of interest to plant and power services engineers

Automation calls for new kind of maintenance man

Increasing automation calls for a highly trained engineer-technician to cope with complex electronic control systems, James J. Durkin, general manager of GE's Service Shops Department told the Association of Iron and Steel Engineers recently.

"In many plants today the maintenance man is the most highly skilled workman in the shop—the last of the craftsmen," Durkin said. "In setting maintenance standards for the ever more automatic factory, we must take this craftsmanship and pride into account and upgrade the job in training, prestige and wage rates.

"The proportion of maintenance workers to total workers is rising and will have to increase drastically in the years ahead. The proportion of highly trained men among them will rise too.

"For computers and programming control systems there is a need for a trained engineer-technician as trouble shooter and repair man. He may merely locate a faulty sealed component, a 'black box,' and replace it with a new one. But he must be well trained in the design of the control system and understand its importance and timeliness to the productive process.

"I feel we will soon see the time when such service is supplied by 'pooled' technicians in key locations throughout the country, maybe on a contract basis," Durkin said.

Automatic steam station: an engineering reality

Complete automation of steam generating stations is now an engineering and economic reality, according to General Electric, who also announced its company's readiness to undertake full automation of generating plants.

The recent development of transistorized digital computers compatible with existing sensing devices and automatic subsystems has made the automatic steam station an engineering reality.

Chief savings from automation will stem from improved reliability which will reduce the forced-outage rate of the giant powermakers.

More precise control of operating conditions would provide further economies through reduced maintenance by eliminating undue stresses resulting from excessive rates of temperature and pressure.

Use of data-logging and continuous alarm equipment would eliminate the need for scores of recording instruments presently required. This would represent additional capitalized savings of approximately $50,000.

In addition to the tangible benefits that can be "price-tagged" with some degree of accuracy, there are intangibles to be considered. For instance, the probability of catastrophic damage to equipment from human error would be virtually eliminated. The likelihood of outages caused by operating errors would become remote.

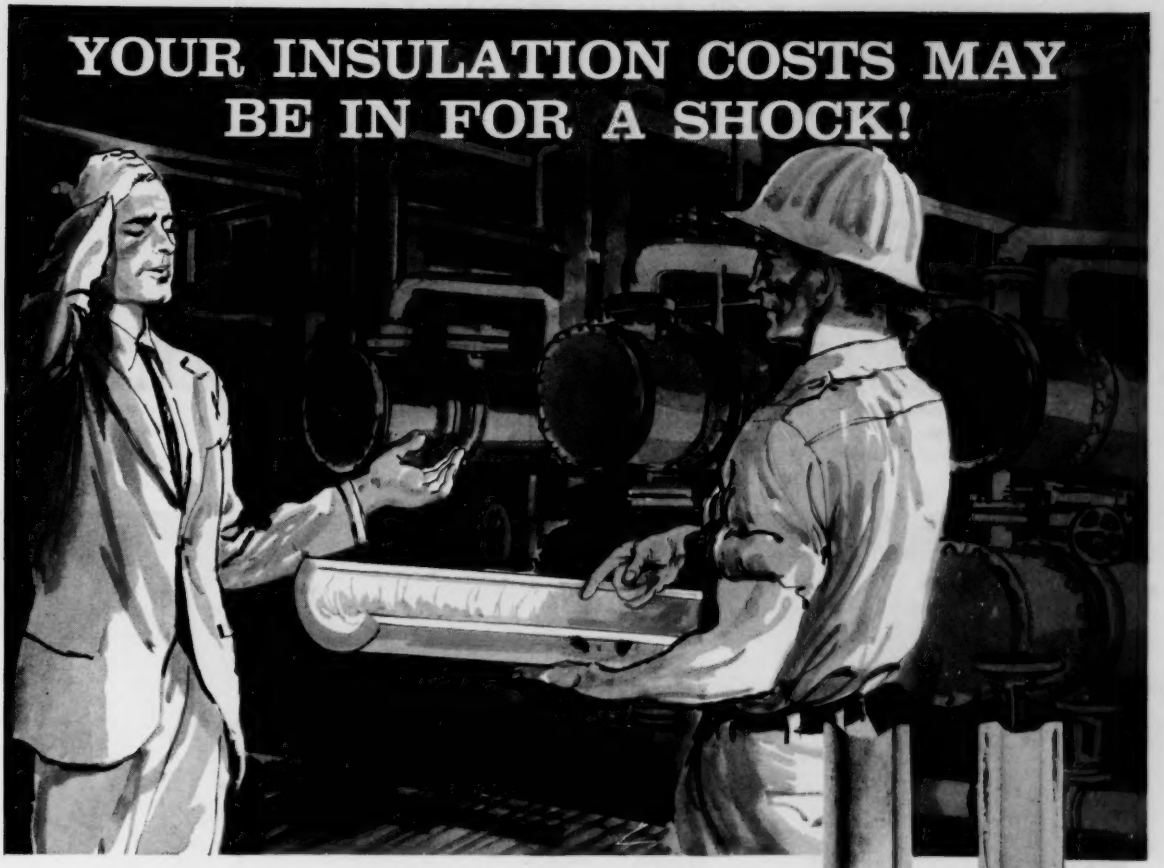
National water treatment service is formed

A recently organized association of water treatment consultants is made up of firms having representatives in all major cities in the country. Through interchange of knowledge, experience, and research facilities, all of the member firms will be able to assist national organizations with their water problems, regardless of location and number of plants involved. It is believed that substantial savings can result from central purchasing, central maintenance and control of water treatment practices.

The association, Associated Laboratories, welcomes inquiries regarding water treatment for cooling tower, power plant, and process water applications.

Inquiries should be directed to Associated Laboratories, 26845 Southfield, Lathrup Village, Mich.

YOUR INSULATION COSTS MAY BE IN FOR A SHOCK!



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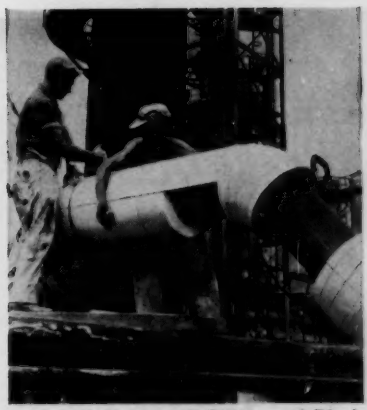
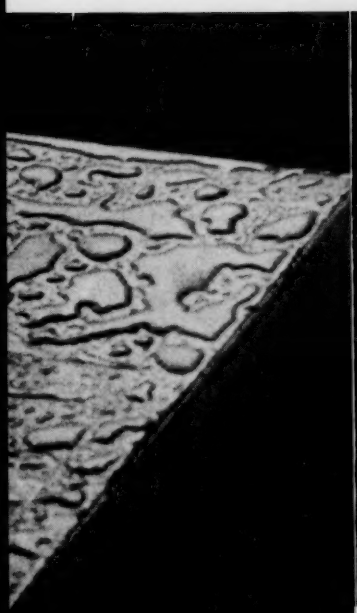
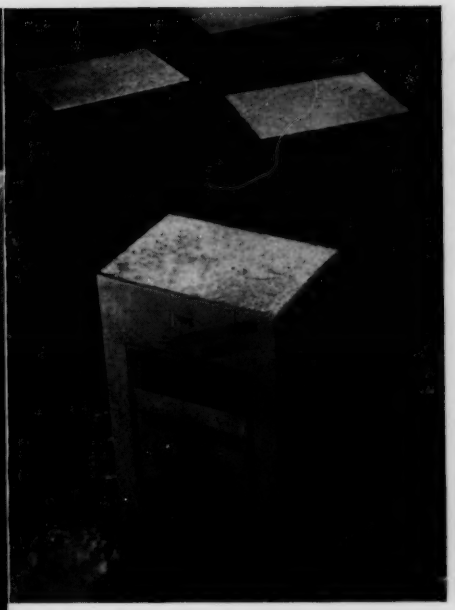
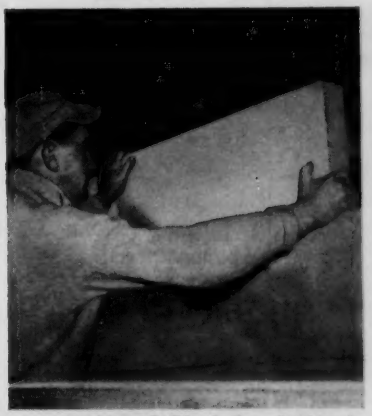


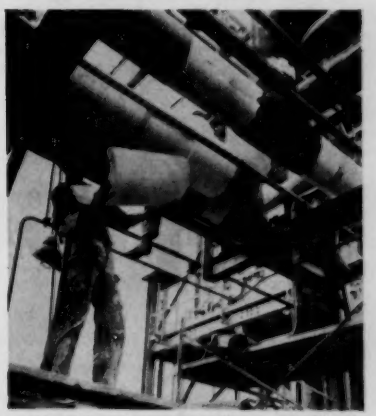
J-M THERMOBESTOS® Pipe and Block Insulation for temperatures to 1200 F., light in weight, top mechanical strength, low *k* factor.







J-M SUPEREX® Block Insulation is furnished in flat or curved blocks, and is recommended for equipment operating at temperatures up to 1900 F.



J-M 85% MAGNESIA Pipe and Block Insulation is designed for use up to 600 F. on heated piping and equipment. The standard for decades.

Now, thanks to a new and exclusive Johns-Manville carton, you can do away with on-the-job-site storage problems. Never mind the snow and rain. Just put the cartons on runners or skids—*and forget about weather problems.*

These cartons are proved by actual test to withstand rain and snow up to three full months! No need for sheds, leantos, tarpaulins or other protection. For only a slight premium, you save time—work—money. And only Johns-Manville offers you this plus value. Ask your J-M Insulation Contract Unit or your nearest J-M sales office.

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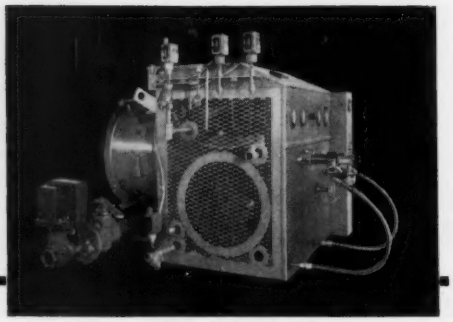

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For more information, circle 9330 opposite back cover.

Industrial gas cleaning organization formed

The industrial Gas Cleaning Institute, Inc., a new trade organization, has been formed by representatives of leading manufacturers of gas cleaning equipment. John T. Doyle, The Thermix Corp., Greenwich, Conn., has been elected its first president.

Titanium welding

The American Welding Society has published a 24-page report on the best methods for welding titanium piping and tubing by the gas tungsten-arc process.

Contents of the report include: process, power supply, electrodes and filler metal; titanium grades, joint design and preparation, cleaning; gas shielding, welding techniques; heat treatment; weld quality tests.

High temps withstood by refractory material

"Asbestosite", a refractory material for use under extremely high temperature conditions, has been developed by Harco Laboratories, Inc.

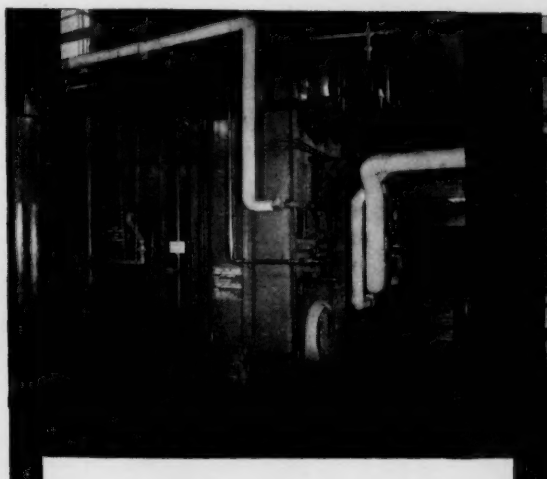
Said to withstand continual exposure to temperatures in the 1000°F to 3000°F range, the material is also capable of being subjected to much higher temperatures during intermittent periods of times.

Develops new test for metal cracking

A Westinghouse research scientist has devised a quick metallurgical test to discover the hot cracking that occurs when metal alloys crack under the heat and stress of welding, or tear when freezing out from the molten state as a casting.

The test is simple, inexpensive and thousands of times faster than other methods for predicting hot cracking. Test samples less than an ounce in weight accurately forecast this behavior susceptibility of metal structures weighing many tons.

The inventor of the test, Dr. F. C. Hull, calls his new technique the "cast pin tear" (CPT) test.



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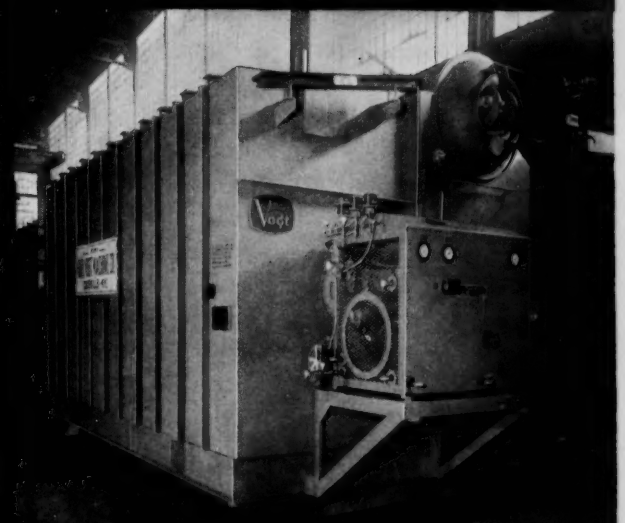

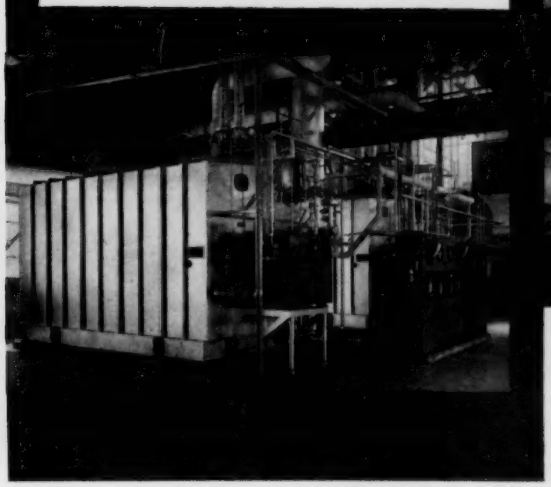

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For more information, circle 9331 opposite back cover.

Picks coal

International Paper now burns coal as low-cost fuel

When the International Paper Company—one of the largest paper companies in the country—made plans to double its production output, at its Mobile, Alabama plant, an engineering survey was made of power and steam facilities. This study indicated the need for increased boiler capacity. It was decided to install new modern coal-burning equipment.

Coal was chosen when estimates pointed up its low cost compared to other available fuels. And, for full use of coal's inherent energy content, the new power plant utilizes the latest in coal-handling and combustion equipment. Burning coal the modern way continues to pay off in steam generating efficiency and substantial fuel savings for International Paper.

Coal is lowest cost fuel

Today, *when the annual cost of fuel often equals the original cost of the boilers,* you should know that bituminous coal is the lowest cost fuel in most industrial areas. And modern coal-burning equipment gives you 15% to 50% more steam per dollar, while automatic operation trims labor costs and eliminates smoke problems. What's more, tremendous coal reserves and mechanized mining procedures assure you a constantly plentiful supply of coal at stable prices.

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If you are remodeling or building new heating or power facilities, it will pay you to consult a qualified engineering firm. Such concerns—familiar with the latest in fuel costs and equipment—can effect great savings for you with the efficiency and economy of coal.

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To help you with fuel problems, the Bituminous Coal Institute offers a free technical advisory service. We welcome the opportunity to work with you, your consulting engineers and architects. If you are concerned with steam costs, write to address below or send coupon. Ask also for case histories booklet, complete with data sheets. You'll find them informative.

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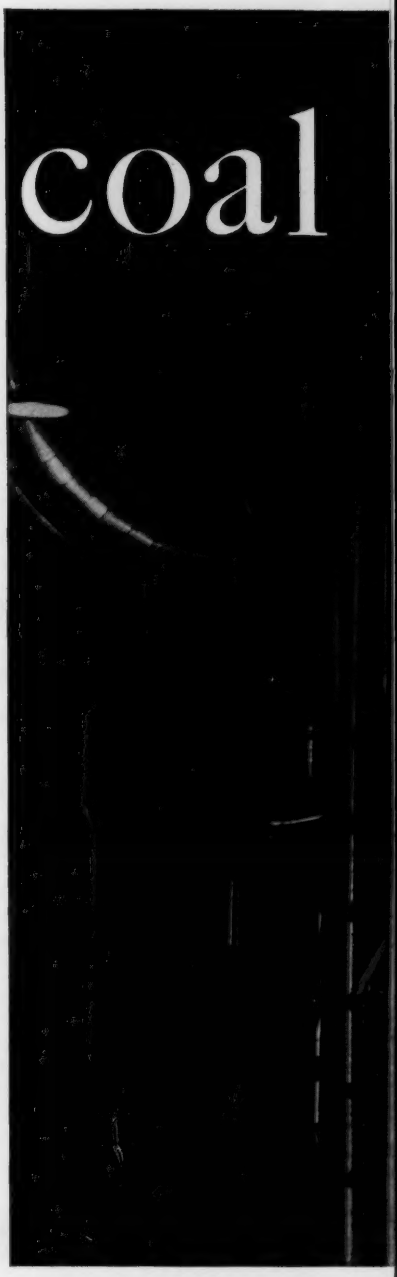
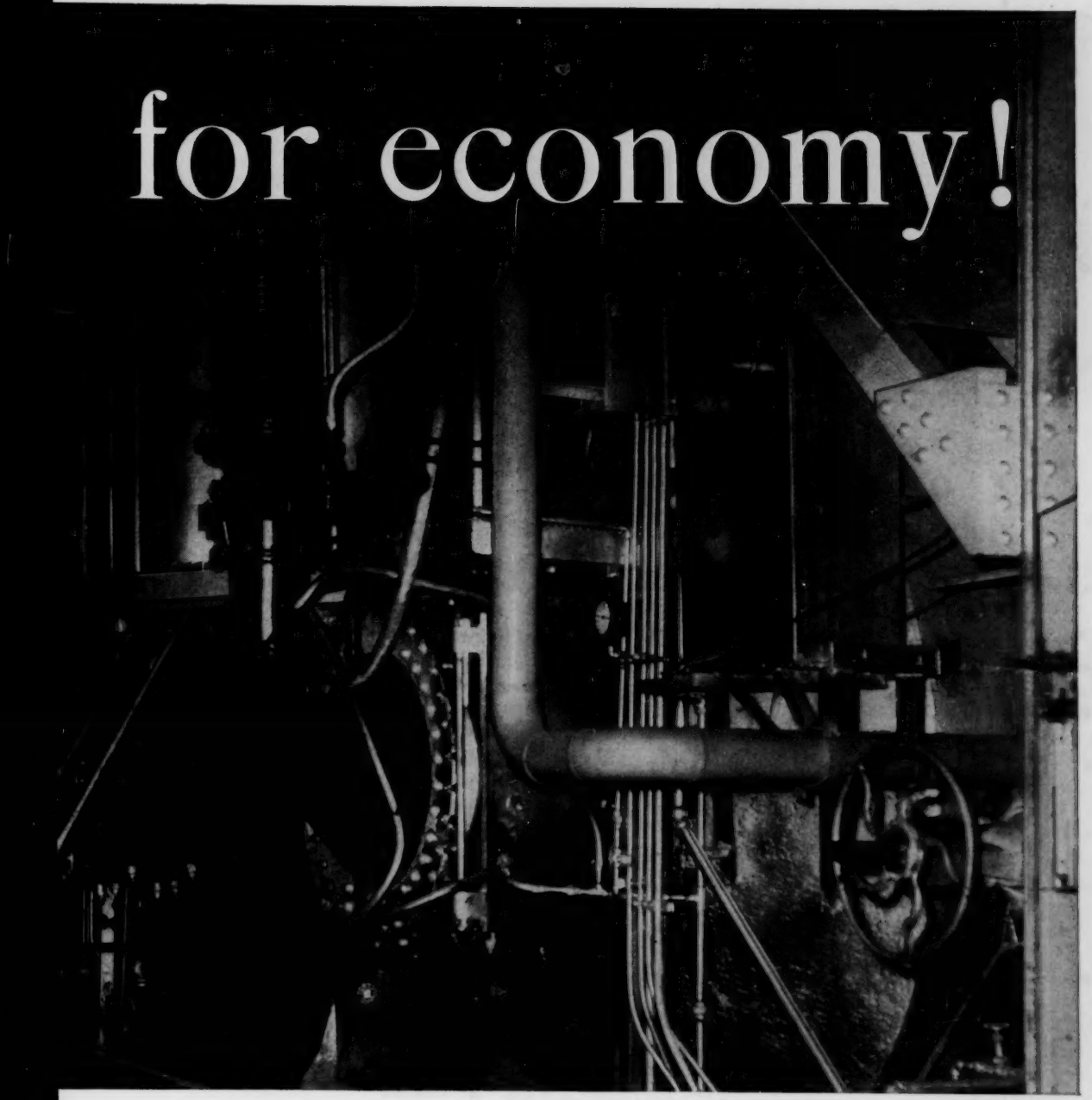


Hagan Boiler and Fuel Control panel regulates two 450,000 lb/hr Babcock & Wilcox boilers for complete, automatic control of steam generation. Generators and steam distribution are also controlled here. Feedwater control, Bailey Meter Co.

for economy!



View from roof of power plant showing river barge delivering coal. Harnischfeger Crane unloads barges into hopper which feeds crusher. From here, Jeffrey Conveyor on right moves coal into inside bunkers, then into 650-ton Neff & Fry silo.

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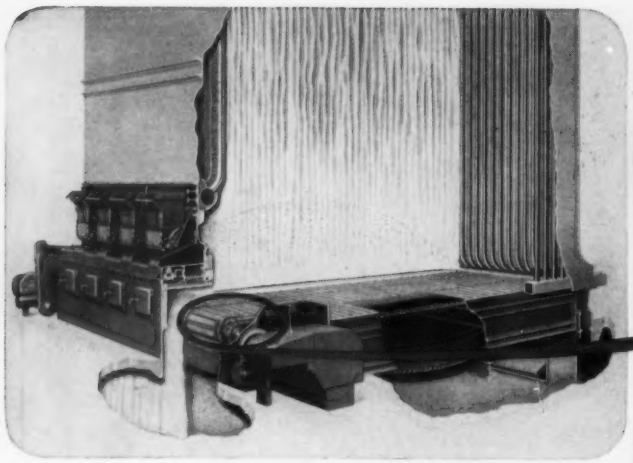
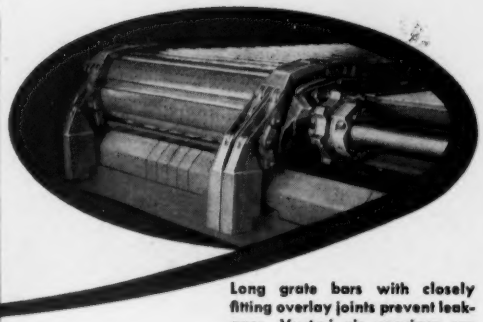
Circle 9410 opposite back cover for item desired.





Long grate bars with closely fitting overlay joints prevent leakages. Venturi air openings are spaced to provide uniform air distribution.

GRATES ARE THE GUTS OF A STOKER — DETROIT ROTOGRATE HAS PLENTY OF INTESTINAL FORTITUDE

No matter what else it has, no stoker can be a complete success without trouble free efficient grates.

The Detroit RotoGrate Stoker has other outstanding features in abundance but without the superior grate design it could never have achieved such instant and lasting success.

The advent of the RotoGrate Stoker established a whole new trend in coal firing and stimulated many competitors but none has seriously challenged the superior performance and long life of the RotoGrate.

Our grates are high resistance metering type with venturi air openings spaced to provide uniform air distribution. Long grate bars have close fitting overlay joints to prevent leakages that cause blow holes and burnouts.

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Burns all grades of bituminous and lignite coals, also many kinds of refuse and by-product wastes.

The RotoGrate for boilers to 400,000 pounds steam per hour capacity; other Detroit Stokers for capacities from 3,000 pounds steam per hour.

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APRIL, 1960
VOL. 2 NO. 4
Plant and Power Services Engineer

Bemis Bag stops shaft vibration with flexible coupling and . . .

Saves $477 with smaller, lighter V-belt drive

WHEN you replace worn-out multiple V-belt drives, you can make big savings by changing to a new type smaller, stronger drive, as did Ray Hollaway, plant engineer at Bemis Bros. Bag Company plant in Peoria, Illinois. At the same time, he also eliminated a serious shaft misalignment and vibration problem on a big 150 hp DC motor.

The large 10-groove sheave and D-section belts on the plant's paper machine mainline shaft needed replacement about eight months ago. Instead of using the same type drive again, a much lighter drive was selected. It achieves the same horsepower with only eight belts and a cost saving of $477. And the new sheaves were quicker and easier to install because they were ordered with special taper-lock bushings.

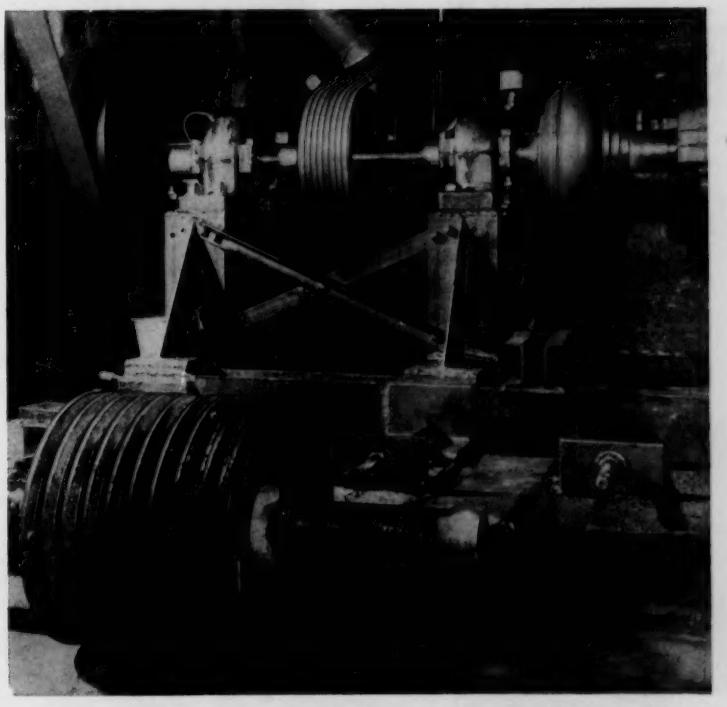
Each of the belts is only ⅝-inch top width. But a deeper cross section design provides more contact with sheave grooves, increasing the pulling power. And the dimensional stability of the belts solves the problem of belt matching. Every belt carries its full share of the load. Crowned belt tops keep cords in alignment for greater strength and prolonged life. Belts are static conducting and are highly resistant to heat, oil, and weather.

When it becomes necessary to replace the belts on the shaft drive at Bemis, the cost will be over $100 less than for the belts previously used.

Replacing the V-belt drive also gave the opportunity to install an 18-inch diameter flexible cushion coupling on the shaft of the big 150-hp direct current motor. This has eliminated a serious vibration and shaft misalignment problem. This same rubber-tire-type coupling has solved so many similar misalignment problems for Bemis that the company has standardized on it for all normal installations.

(Dyna-V Drive and Para-flex Coupling are manufactured by Dodge Manufacturing Corp., Dept. P&PSE, Mishawaka, Indiana.)

Circle 9333 opposite back cover.



Heavy, costly sheave in foreground was one of those replaced by a smaller, lighter drive on shaft. Serious misalignment and shock load problem on shaft from 150 hp motor was solved at the same time by installing flexible cushion coupling at the right

Some very modern plant services went into International Minerals & Chemical Corp.'s modern Administrative and Research Center. If you are looking for a modern, efficient method of space heating and cooling, take a look at the interesting system the company installed

Combination Radiant-and-Air Heating System Gives Top Control, Efficiency, Comfort

W. J. MULLINEAUX, Plant Engineer
International Minerals & Chemicals Corp., Skokie, Ill.
with **GEORGE MICHAEL,** Editor

Modern buildings deserve modern plant services . . . and that is just what International Minerals & Chemical Corp. installed when the company built its very modern headquarters at Skokie, Ill.

This new Administrative and Research Center consists of six structures—all of which are connected by underground passageways. In addition, a tunnel was constructed to the parking lot. The total area of the buildings and passageways is approximately 196,000 sq ft.

In order to heat and cool this large area efficiently, the architects and engineers recommended an air conditioning system that is 50% radiant water and 50% air.

This is how the heating and cooling installation was designed:

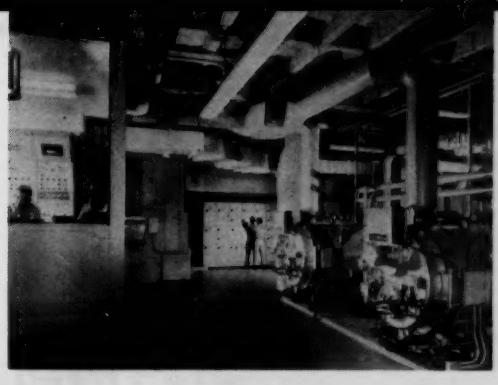
Concealed in the ceiling and ringing the walls of the two larger buildings are radiant heating pipes, used for both heating and cooling. In the winter, these pipes carry between 80 and 130°F water, depending upon the outdoor temperature. In hot weather, the circulating water is chilled to 42°F and circulated at 50 to 80°F. The radiant system is divided in four zones. Each zone is manually adjusted to account for solar effect through the day.

International Minerals & Chemical Corp.'s modern Administrative and Research Center uses some very modern plant services that include a combination radiant-air heating and cooling for top efficiency and comfort

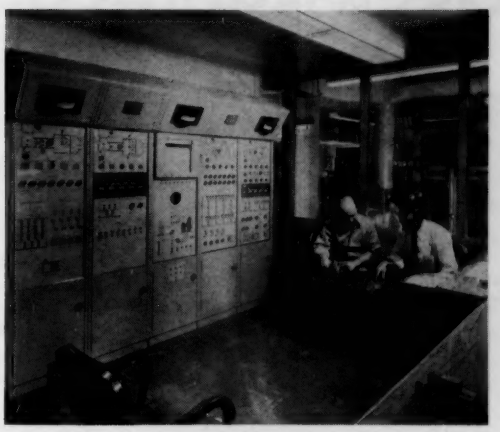
The ceilings consist of radiant panels—made of perforated aluminum—attached directly to pipe grids. Above the pipe, a 2-inch fiber-glass insulation is used to abate noise. For heating, the hot water is circulated through the grids, and the panels are heated by conduction. For the cooling cycle, cold water (above the dew point) is circulated through the pipe grids. In this way, the ceiling acts as a radiator that heats or cools independently of air movement.

Along the base of each outer wall is a four-inch return duct which removes all air immediately for maximum comfort. Make-up air passed through an electrostatic precipitator and applied through ceiling diffusers is used for temperature control and ventilation. Through automatic operation of a remote control panel in the boiler room office, this air handling system is heated or cooled to maintain proper temperatures in the building. Thermostats are located in various zones and offices on each floor.

The one-story buildings are heated and cooled by similar air handling system.



The boiler room is as modern as the Center itself. Two 100-hp packaged boilers were installed to handle the heating load. The efficiency of the combination system is such that, except in the most severe weather, one boiler is capable of handling the entire heating load. They operate on oil in winter and gas in summer



Entire heating and cooling system is controlled from this panel located in boiler room office. In larger buildings, radiant-panel ceilings are manually controlled at this point. Thermostats located in offices and various zones monitor air handling system for fine temperature control

Radiant-panel ceilings consist of perforated aluminum panels attached to pipe grids. The panels are heated or cooled by conduction from water passing through these grids. A two-inch fiberglass insulation above pipe abates noise. Make-up air, used for fine temperature control, enters through ceiling diffusers. It is withdrawn through returns located at base of outer walls. This has been found to be a very effective arrangement for curtainwall construction

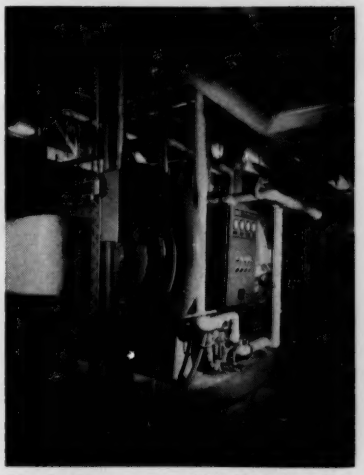
For this set-up, it was decided that two 100-hp combination oil- and gas-fired hot-water boilers would be installed. Automatic packaged boilers of the four-pass design were chosen. These quiet and efficient units are in keeping with modern design that characterizes the Center.

The system's efficiency and the performance of the boilers are demonstrated by the fact that, in all but the most severe weather, one boiler is able to provide sufficient heat for the underground passageways and the buildings, except the lab which has its own heating and air conditioning systems.

The second boiler is kept in reserve for use when the temperature in any particular building must be raised—both "kicking in" to give instant heat. This second boiler is also used when the other is being cleaned.

The boilers cut in and out as heat is needed. This, of course, improves the operating efficiency of the entire system.

During the heating season, about 150,000 gallons of No. 6 fuel oil are used. It is kept at an atomization temperature of 180°F. Through the summer months, the boilers operate on gas obtained at an off-season rate.



Circulating water is chilled by this 450-ton centrifugal unit located in penthouse of larger building

For maintenance, the hinged doors, front and rear, are a big help in cleaning. Only six bolts have to be removed to open the front head. Each boiler is cleaned—punching the tubes—once a month, with thorough cleaning twice a year. This involves the entire system including the stacks.

During the summer, the boilers provide hot water for reheating the cooled air. The air is cooled to 50—65°F and then reheated to balance the thermostats located in the various zones. In very hot weather, a differential of 15°F is maintained between the outside and inside temperatures.

Both the radiant panels and the air are cooled by circulating water, chilled by a Trane hermetic centrifugal refrigeration unit rated at 450 tons and located in the penthouse of the largest building. Other buildings use air, cooled by chilled water from this unit.

(Packaged boilers are manufactured by Cleaver-Brooks Company, Dept. P&PSE, 326 East Keefe Avenue, Milwaukee 12, Wis.)

Circle 9334 opposite back cover.

(Radiant Ceilings are manufactured by Burgess-Manning Company, Architectural Products Division, Dept. P&PSE, 713 E. Park Avenue, Libertyville, Ill.)

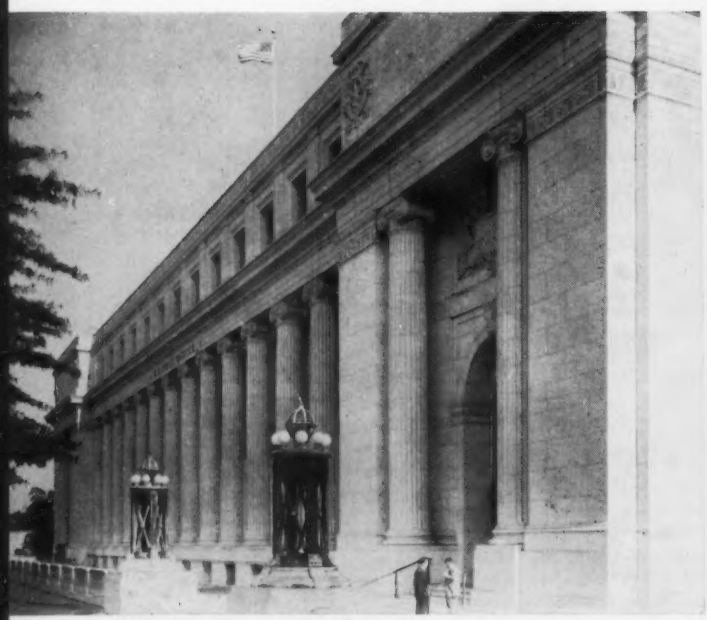
Circle 9335 opposite back cover.

Electrical Modernization

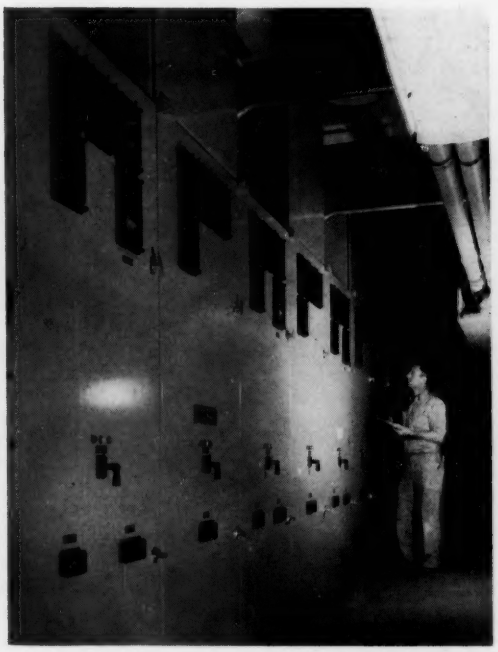
Washington, D.C., Post Office recently doubled its electrical capacity to handle added load due to installation of over 1000 new motors in a mechanization and air conditioning program. They were able to do this with quick delivery of electrical distribution equipment and without disrupting existing facilities supplying power for lighting and services

THE Washington (D.C.) City Post Office — like a lot of industrial installations — has converted to an extensive mechanized operation. This recently completed program consisted of installing more than six miles of conveyors, together with automatic canceling and mail sorting equipment. This extensive mechanization of letter and package flow meant throwing more than a thousand new motors on the power system.

For this load, there was adequate



Most mechanized in the world, the Washington (D.C.) Post Office installed more than six miles of conveyors, together with automatic canceling and sorting equipment. The addition of air conditioning required the modernization of electrical system to handle additional load, doubling the total capacity



Specially built to meet space limitations, 15kv switchgear was delivered within six months of contract award — within 13 weeks of time final details were ironed out. Power coming into building from three separate sources enters through existing switchgear and splits to these new units

Meets Mechanization Needs

electrical capacity, but the added heat would create the need for better ventilation and for air conditioning in the summer. This called for a modernization of the facility's electrical system.

Benefits of the mechanization program will be substantial. Besides breaking a major bottleneck in the sorting and distribution of mail, the Post Office will serve as a laboratory and backyard proving ground for even more efficient conveyors, electronic sorters, automatic canceling machines and other mail handling aids for stepping up mail service at other installations.

Another by-product will be greater comfort and improved efficiency for the more than 5000 postal employees during the hot summer months. Postal engineers estimate that a gain of only one-half of one percent in efficiency through greater comfort will more than justify the air conditioning installation.

To meet the power needs, new distribution facilities were supplied to add a capacity of 6000 kva to the existing 5100 kva. The new capacity was installed smoothly and efficiently, without disruption of existing facilities supplying power for lighting and building services. New equipment includes 5- and 15-kv and 600-volt switchgear, network transformers, bus duct, motor control boards, and fused interrupter switches.

Distribution System

Power for the post office comes in from Potomac Electric Power Co. through three separate 13.8kv sources, any two of which are capable of meeting system requirements in case of temporary outage on any one circuit. These mains enter the building through the existing 15kv switchgear which was installed several years ago to meet enlarged plant services and mechanized equipment needs.

This arrangement for entrance is left intact, and power now feeds through these units to the new 15kv gear, incorporating 1200-amp, 250-mva interrupting capacity breakers.

This switchgear was specially designed because of space limitations and is built around six frames rather than the nine which would be used for standard 15kv gear.

Power coming out of the existing 15kv switchgear splits, part going to the new breakers protecting the old load, and part going through

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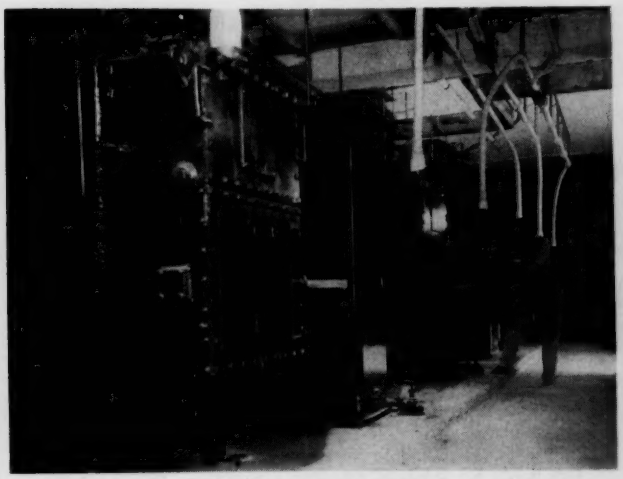
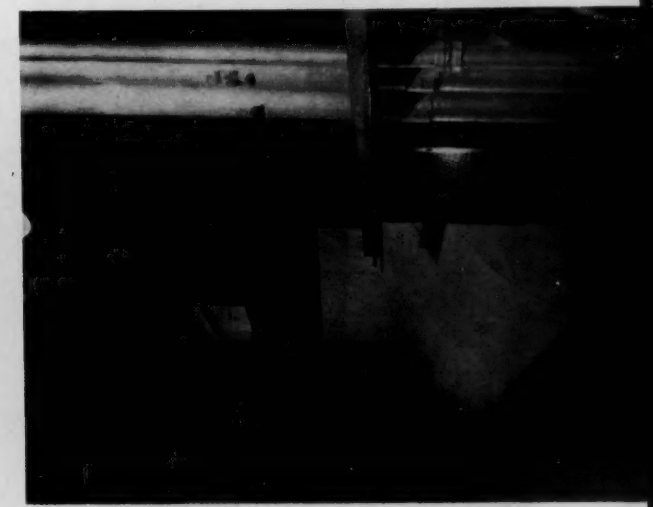


Half of the power supplies building lighting and power requirements, and the other half feeds to these six 1000kva power transformers. Here it is stepped down to 4160 volts for large motors, or to 480/277 volts for small motors



Bus duct carries power at 480/277 volts from transformer secondaries to 600-volt switchgear and motor control centers. Conduit running adjacent to duct carries 4160-volt power to the large compressor motors

Electrical modernization

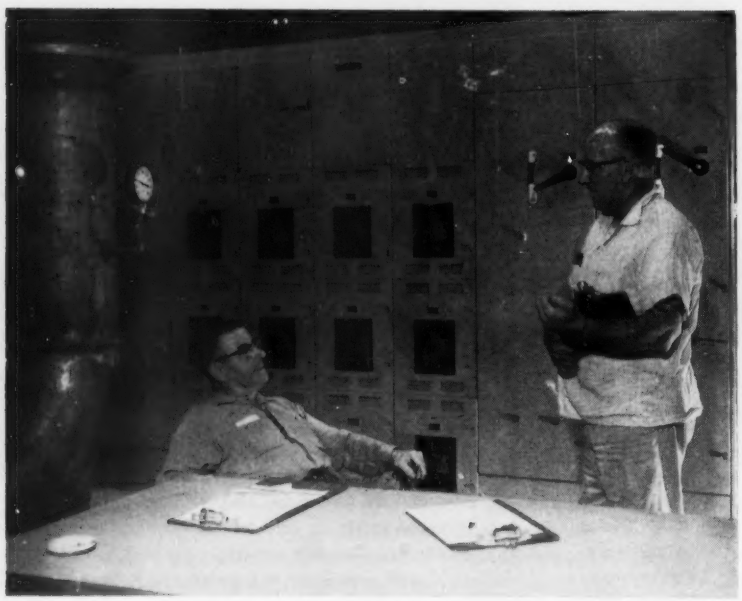
From preceding page

new breakers to the new load. This latter portion then feeds to six 1000kva transformers.

Three of these step power down from the 13.2kv primary voltage to 4160 volts. This feeds through three 5 kv breakers rated 1200 amps at 250mva interrupting capacity to two 1200-hp motors driving the main air conditioning compressors.

Secondary power from the other three transformers, at 480/277 volts, feeds through network protectors to a common bus. The bus carries power to 600-volt switchgear and then to motor control centers, which control power for the smaller motors throughout the building.

5kv switchgear protects large compressor motors of air conditioning system



Final distribution point for low voltage is large motor control center, one of two supplying small motors throughout the building. This center incorporates 600-volt switchgear and size 5 motor controls. There are over 1000 small motors scattered through the 500,000-sq ft building

Delivery 6 Weeks Early

The electrical equipment was delivered in just 13 weeks from the time final details were ironed out and in less than six months from the time contracts were awarded.

The fast delivery shaved six weeks from normal delivery time, despite the fact that the installation involved large switchgear of non-standard design, and a wide variety of equipment. It permitted start-up of new air conditioning equipment by a July 1, 1959 deadline — in time to beat the worst of the summer heat.

In this modernization, an outstanding electrical installation job was performed by the Walter Truland Corporation, electrical contractors. Their task was complicated by dual requirements: install rapidly to meet the imposed deadline; perform the installation work without interruption or inconvenience to normal post office activities.

One of the toughest problems was that of obtaining space to unload equipment without conflicting with normal post office work. Switching of feeders was accomplished during off-peak periods so that there was no interruption of power to equipment in use.

(Switchgear and transformers were supplied by I-T-E Circuit Breaker Company, Dept. P&PSE, 1900 Hamilton, Philadelphia, Pa.)

(Bus duct was supplied by Bulldog Electrical Products Division of I-T-E Circuit Breaker Company, Dept. P&PSE, Detroit, Mich.)

(Motor Control Centers were supplied by Wilson Electrical Equipment Co., subsidiary of I-T-E Circuit Breaker Company, Dept. P&PSE, Houston, Texas.)

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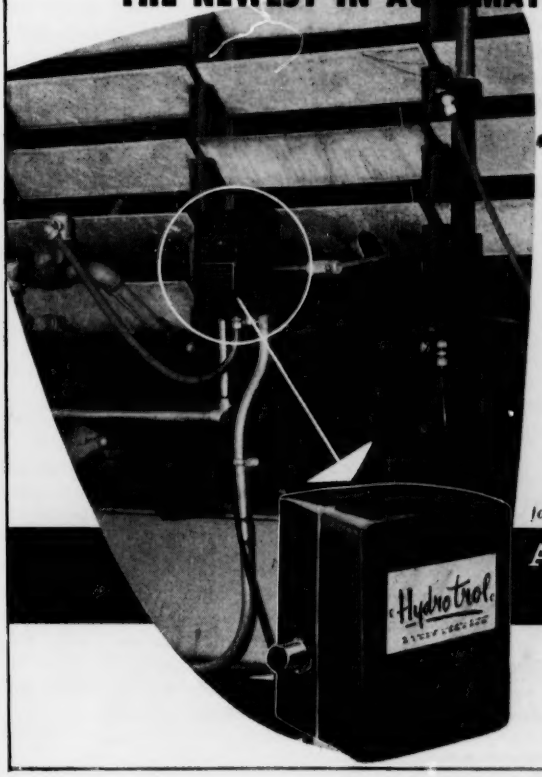

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For more information, circle 9338 opposite back cover.

Put More 'Zip' Into Motors

If you would like to upgrade horsepower ratings of existing motors to realize savings from reduced maintenance, longer motor life, and improved power factor, you can take a tip from engineers who upped horsepower ratings of various motors more than 30% by rewinding with silicone insulated wire

GEORGE V. MICHAEL
Editor
with **MARK POSEY**
Howard Electric Company
Detroit 7, Michigan

At two major plants of a large midwestern process company, the horsepower of various motors has been increased more than 30 percent. This was accomplished by rewinding and silicone-insulating the motors to allow them to handle fluctuating overloads without fear of burnouts. Three different types of motors were involved in this operation:

Pump Motors

At one of the plants, the horsepower of a liquor-circulating pump motor was upped from 30 to 40 hp to meet greater production demands. With this upgrading, the motor's new load is 40 hp. As this load is the same as the motor's new horsepower, no capacitors for power factor correction—often necessary when squirrel-cage induction motors operate at part load—are required. The motors were rewound with #14 heavy silicone-enameled wire.

In maintenance costs, the greatest savings were made. The frequent failures that would have occurred had not the motors been uprated would have cost approximately 16 manhours at $2.50 per hr or $40.00 plus $5.00 for paper work each. These rewound 220/440-volt motors have been running continuously for approximately ½ year at a time since December 1957 without a failure.

The cost for uprating the two motors was $425. If a new motor was purchased, the costs would have been: $875 for a new motor, $32 for a new motor base and a new coupling at $40. The labor to make this change would be approximately $10. Total saving here was $532.

At the other plant, two applications were made—one on motors for a centrifuge or decanter application, the other is on pumps for pneumatic-conveying of cement to top of 90-foot silos.

Pneumatic Pump Motors

The latter—a 75-hp motor—is a good example of achieving a better power factor. Four of these motors were uprated from 75 to 95 hp as the average load is 90 hp with peak loads of 105 hp. The four 440-volt motors were rewound in the summer of 1957 with #9 square double glass silicone wire. The power factor is much improved over what it would be with a 100-hp motor.

Maintenance, in case of failure, on this motor amounts to 28 manhours at $2.50 an hr plus $5 for paper work.

The cost for uprating one of these motors was $930. The costs for a new 100-hp motor at 90 rpm would have been $2640 with $131 for a new coupling and $950 for labor.

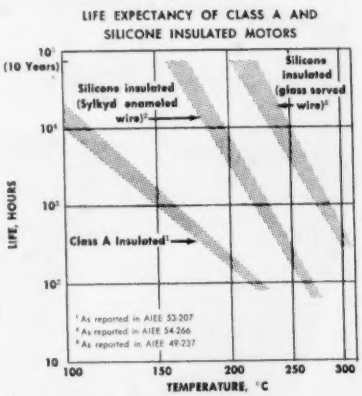
They have been running 8 hrs a day since rewinding. Recently one motor had been causing its overload-control—set for 100-hp—to trip. When the trouble was located, a defective wire in its starter was causing it to run on single phase. There had apparently been no damage to the motor.

Centrifuge Motors

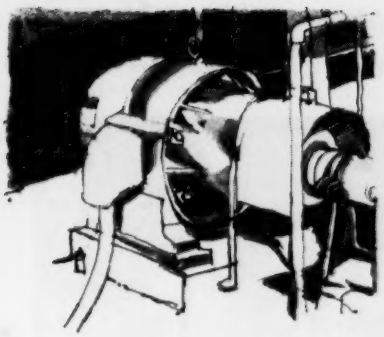
There are six 15-hp motors used to drive four centrifuges. These centrifuges—like cream separators—cannot be brought up to speed quickly, but take 1 to 1½ minutes to reach operating speed. During startup, these motors pull 25 to 30 hp through a separate circuit without overload protection.

This is a continuous process, and if it was not for a buildup of materials on the centrifuges, there may not have been a need for rewinding these motors with double silicone enameled wire. This buildup causes the overload protection through the running circuit to trip during start-up.

The operator, in attempting to break up the deposit, will restart the unit as many as three or four times before shutting down the unit for cleaning.



Time-temperature chart, comparing the life expectancy of insulation systems, is based on data compiled from field experience



This occurs four to five times a month resulting in an average failure every four months. Each time, maintenance costs amounted to $23 plus downtime at $25 an hour.

In order to take these loads, a 25-hp motor would have been needed. The resulting power factor with a 25-hp motor would have been very low during the rest of the operation. Uprating the motors to 25 hp has resulted in power savings through this better power factor. The first motor was rewound in April, 1956; the last in April, 1958. There has been no failure to date.

Rewinding costs were $240 a motor. If the required 25-hp motor were purchased, the cost would be about $675.

What Silicones Do

Thermal stability of silicone insulations allows equipment to operate at overload capacity without changing copper-to-iron ratio—overloads as high as 25 to 50 percent above rated load won't affect life of equipment designed for Class A temperature rise when rewound with silicone insulating materials.

Accompanying chart shows life expectancy curves of silicone insulation systems. In addition, silicone insulations are relatively unaffected by moisture, weathering, corrosive atmospheres, dirt, vibration, and corona.

(More information on rewinding motors with silicone may be obtained from Dow Corning Corporation, Dept. P&PSE, Midland, Mich.)

Circle 9339 opposite back cover.

HENSZEY *Remote Mounted*
BOILER WATER METER

✓ CHECK YOUR BOILER OUTPUT
1 *DAILY STEAM LOAD* — Read the continuous integrating recorder
2 *INSTANTANEOUS LOAD* — Check the visual Flowrator
3 *PEAK LOAD* — Refer to the permanent 24-hour recording charts

...gives you the facts you need

Henszey Boiler Water Meters are precision-designed to keep you informed so that you can maintain your boiler and power plant at maximum efficiency and top performance. It dependably, accurately, and inexpensively meters, indicates, and records the total feed to the boiler, and affords you a permanent record of your boiler output.

The rugged construction of this versatile meter also makes it the ideal instrument to measure raw feed makeup, process returns, and boiler blowdown. *Calibration changes can be made on the job.*

Simple, easily maintained component parts, plus flexibility of installation to meet your specific requirements. Write today for full details.

SENTRY

SENTRY EQUIPMENT CORP. DEPT. P OCONOMOWOC WISCONSIN

For more information, circle 9340 opposite back cover.

Boiler Tube Service

fast
— call these representatives
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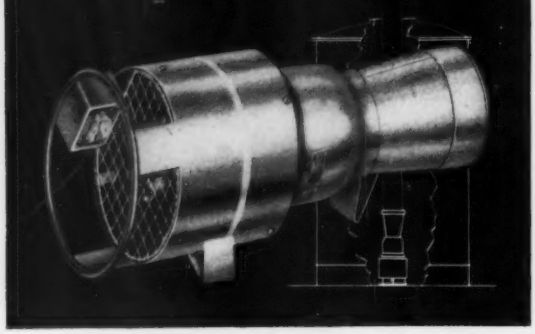
For more information, circle 9341 opposite back cover.

COPPUS BLUE RIBBON PRODUCTS



COPPUS "Blue Ribbon" Ventilator-Blowers are portable and easily adaptable . . . for supplying fresh air or discharging foul air or fumes. Mail coupon below for facts.

COPPUS ENGINEERING CORP.
184 Park Avenue, Worcester 10, Mass.

- ☐ in tanks, tank cars
- ☐ in underground manholes
- ☐ for exhausting welding fumes
- ☐ on boiler repair jobs
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- ☐ to stir up stagnant air wherever men are working or material is drying

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Company .....
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COPPUS BLOWERS

Circle 9342 opposite back cover.

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PLANT and POWER SERVICES ENGINEER is looking for good nomographs designed to simplify calculations necessary to efficient plant and power services. If you have such a nomograph that has been helpful to you in your work — and it has not been published before — send it to:

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NEW SOLUTIONS

to your plant and power services problems

Sound traps built into ventilating ducts going to each cell absorb sound by permitting free flow of air

Noise gets a "life sentence," as 261 sound traps . . .

Absorb ventilating duct noises to thwart prison 'grapevine'

Unique sound traps installed in ventilating ducts of the new Oregon State Correctional Institution have inmates mourning the passing of the prison "grapevine."

At the older State Penitentiary, it seemed that the walls had ears. Ventilating ducts leading from cell to cell formed veritable speaking tubes through which prisoners communicated even when supposedly in "solitary."

The ventilating duct "grapevine" was used by convict leaders to promote organized programs of disobedience, even in attempts to stir up riots. Threats to prisoners who supposedly had "ratted" on others floated through the ducts and notes dropped into them were fished out by prisoners in cells below.

During planning stages for the new institution, officials sought a way to construct the ducts so air, but not sound, would flow properly.

The problem was solved, and a total of 261 sound traps were installed—one for each cell. The traps fit directly into the ventilating ducts. Each is two feet long and contains a scientifically designed array of filter materials and traps which muffle sounds in the high, low and middle frequencies.

Fiber glass and other acoustal fillers are arranged within the units in streamlined turns, together with

special duct traps and other internal structures which absorb noise.

These traps have also been effectively used to keep noise of air conditioning fans from being heard where it would be objectional. It is the first time they have been used in an entire penal institution to silence the "grapevine."

("Aircuostats" are manufactured by Koppers Company, Inc., Metal Products Division, Dept. P&PSE, Pittsburgh, Pa.)

Circle 9343 opposite back cover.

Cast aluminum bus bar racks up 65% saving

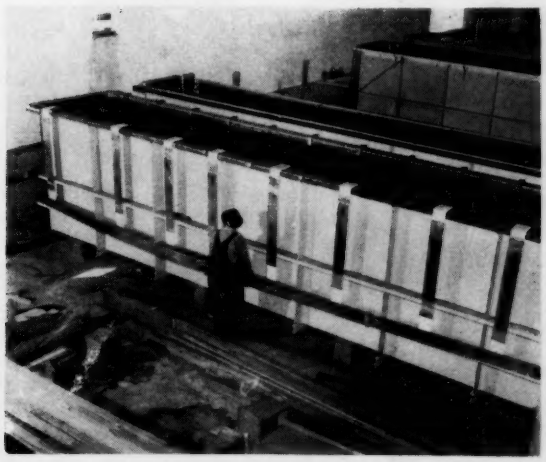
Important cost savings resulted when cast aluminum bus bar recently was installed at Aluminum Extrusion Company's Los Angeles plant. The bus bar's cost was 30 percent of the cost of bus made of other metals with equivalent current capacity. Because of aluminum's light weight and ease of bending, the installation cost on this job was approximately 65 percent of the estimated cost had another metal bus been used.

The lightweight bus is used to feed a 7500-amp anodizing tank. Connections to the rectifier and tank were made by silver plating the bus bar ends and bolting the joints. All splices and right-angle joints were made by the Cadweld process, and no unusual problems were encountered.

Bus size on this job was $\frac{3}{8}$" x 6" x 20'. One workman could easily handle this piece as it weighed approximately 40 lb. The bus has a capacity of 840 amps per square inch.

(Cast aluminum bus bar is development of Kaiser Aluminum & Chemical Corporation, Dept. P&PSE, 1924 Broadway, Oakland 12, Calif.)

Circle 9344 opposite back cover.



Lightweight cast aluminum bus bar saved 65 percent in installation costs. It has a capacity of 840 amps per square inch

Have you tried the **FLUX** with the **BULLDOZER** action?

LA-CO FLUX

REGULAR

for all general purpose soft soldering

NON-ACID • SELF CLOSING

To call La-Co Flux "self-cleaning" is almost like calling today's sports car a horseless carriage. La-Co Flux literally bulldozes right thru rust, oil and oxides, leaving the surface whistle-clean. Result: a perfect bond of metal and solder as strong as the tensile strength of the solder itself. It's one flux that works right thru protective coating on today's galvanized sheet. No cleaning, sanding or scraping needed; all the muscle is built in. There's no safer flux, either—no acid of any kind, no danger of burns of fumes, no staining or pitting of metal. Comes in paste or liquid form, or in handy pencil-like Flux-stiks.

Look for La-Co at your supplier — or write on letterhead for sample.

Flux Problems? We'll be glad to help; no obligation

LA-CO BRAND

LAKE CHEMICAL CO.

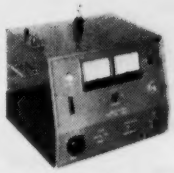
3090 W. Carroll Ave., Chicago 12, Ill.

Circle 9345 opposite back cover.

TEST INSTRUMENTS

for ELECTRICAL EQUIPMENT

Laboratory..Production..Maintenance



Voltage Breakdown

Insulation Leakage

0.02 mma to 10 ma

Test Potentials to 30 kv

Bench HYPOT® Test Sets, a-c and d-c models, have outputs to 30 kv. Separate 4½" meters for test voltage and leakage current. Wide selection of models.

Model 424 Bench HYPOT® provides 0-5000 v d-c. For testing cables, condensers, coils, transformers, motors, and assemblies. Measures leakage current from 0.1 microampere to 100 microamperes over four scale ranges. Rapid testing of capacitors with output of 5 milliamperes under short circuit. Operates from 110-120 v 50/60 c outlet with long-life selenium high voltage supply.

Net complete $497.50

- **Insulation Materials Tester**

  Dielectric strength determined to laboratory precision. Interchangeable test fixtures for varnishes, porcelain, tape, acetate sheet, films, tubing and cloth. Write for Bulletin, Model 4501 HYPOT® Materials Tester.

- **Insulating Oils Tester**

  New portable design, only 42 lbs., for testing insulating oils at point of application as well as in the laboratory. Test potential variable from 0 to 35 kv, with 2 kva rating. Write for bulletin Model 4505 HYPOT® Oil Tester.

- **Measure Resistance to FIVE MILLION MEGOHMS**

  VIBROTEST® megohmmeters provide direct reading measurements to FIVE million megohms and higher with electronic power supply that eliminates tedious cranking. Write for bulletin "VIBROTEST".

- **Test Electrical Grounds**

  VIBROGROUND® measures resistance to ground of electronic, telephone, and power equipment. Direct reading. Operates from self-contained battery. Write for Bulletin "VIBROGROUND".

Complete Catalog — Write today!

ASSOCIATED RESEARCH, Incorporated

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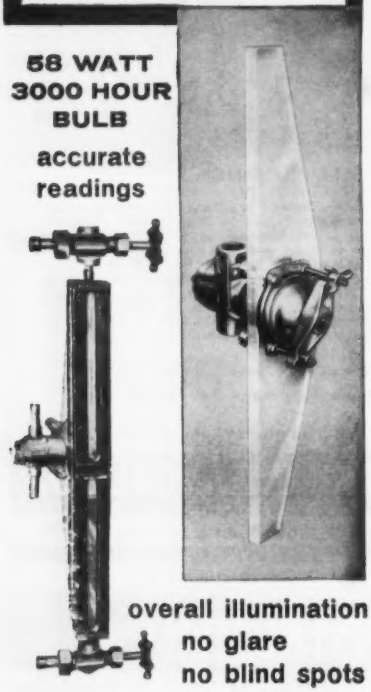
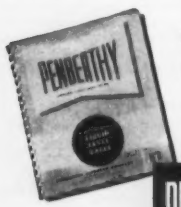
Circle 9346 opposite back cover.

NEW!
PENBERTHY ILLUMINATORS
for Liquid Level Gages



Faster, more accurate liquid level readings are provided by Penberthy's new, improved, explosion-proof, dust-tight illuminators. 58 Watt Bulb (with medium screw base) gives higher light intensity for 4-times the life of ordinary illuminators. Exclusive rugged aluminum housing over bulb extends bulb life, offers better protection and simplifies relamping. Clear plastic wedge diffuses light over entire length of gage glass.

Illuminators are easily installed on present or new gages. Available in single or double sections, they are used in combination for gages with 3 or more sections. Approved by Underwriters' Laboratories for Class 1, Group C and D hazardous locations.



For further information on Penberthy Illuminators, liquid level gages and valves, write or phone. Ask for Catalog #36.

PENBERTHY

PENBERTHY MANUFACTURING CO.
Division of Buffalo-Eclipse Corporation
Prophetstown, Illinois
Circle 9347 opposite back cover.

NEW DEVELOPMENTS
For effective plant and power services operation

Liquid level controls are non-metallic

Will resist corrosion or galvanic attack by problem liquids

All parts of liquid level controls in contact with liquids or vapors are of non-metallic polyvinyl chloride.

When used with liquids that present problems in handling, the controls are: immune to galvanic or electrolytic attack; corrosion resistant; immune to oxidizing agents. The smooth surface discourages any tendency to scale or act as host for deposits. It will not contaminate or impart odors or tastes to the liquid.

Because the construction is of non-flammable and non-sparking materials, the controls can be used safely in handling inflammable and explosive liquids as well as in volatile fume areas.

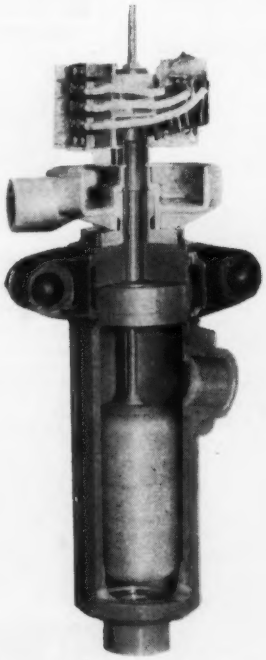
Made in two models the controls are for use with any liquid of specific gravity 0.70 or above. Chamber and float construction are for service at 100 psi at 70°F, or 50 psi at 140°F.

Model NM-1 is an external float cage unit with a sealed body and float totally enclosed.

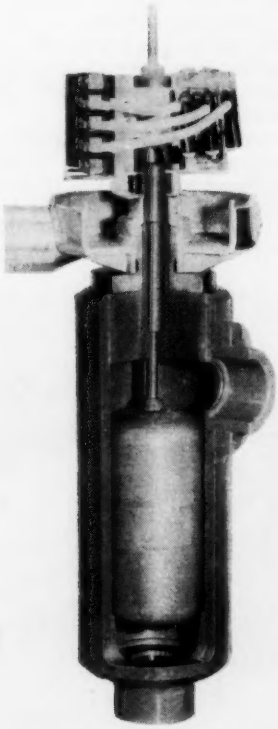
Model NM-2 is a flanged-style chamber unit, with head flange secured to the chamber by means of a victaulic closure with gasket. Both are provided, on standard units, with 1-inch pipe socket connections.

(Non-metallic liquid level controls are development of Magnetrol, Inc., Dept. P&PSE, 2110 S. Marshall Blvd., Chicago, Ill.)

Circle 9348 opposite back cover.



Cut-away of flanged style chamber unit with victaulic closure with gasket



Cut-away of external float cage unit with sealed body and float totally enclosed

Automatic system handles cooling tower water treatment problems

Automatic water treatment chemical feeder device adds treatment chemicals and controls concentration automatically in direct proportion to make-up water — regardless of evaporation — in cooling towers.

It is designed for use on 20 to 2000 ton towers. Besides direct tower treatment, it can be used for remote treatment feed to circulating line.

("Hydrotrol" system is product of Associated Laboratories, Dept. P&P SE, 26845 Southfield Rd., Lathrup Village, Mich.)

Circle 9349 opposite back cover.

Air-loaded pilots hold close vacuum control

Control accuracy to within ½ psi or better from positive pressures through the vacuum range to 30" Hg is made possible by series of air-adjusted pressure pilots. Pilots can also be used in conjunction with a temperature recorder-controller for control of process temperatures.

Extreme sensitivity of control for low-pressure systems or for vacuum heating systems is obtained by the vacuum-range pilots.

Remote air loading of the pilot makes possible centralized control by locating the pressure adjusting panel at any convenient distance from the regulator. Mounting the pilot at the valve provides greater stability of control and consequent savings in fuel.

Accurate regulation in the vacuum-range permits the use of the pressure pilot with a temperature pilot to gain full modulation of heater input.

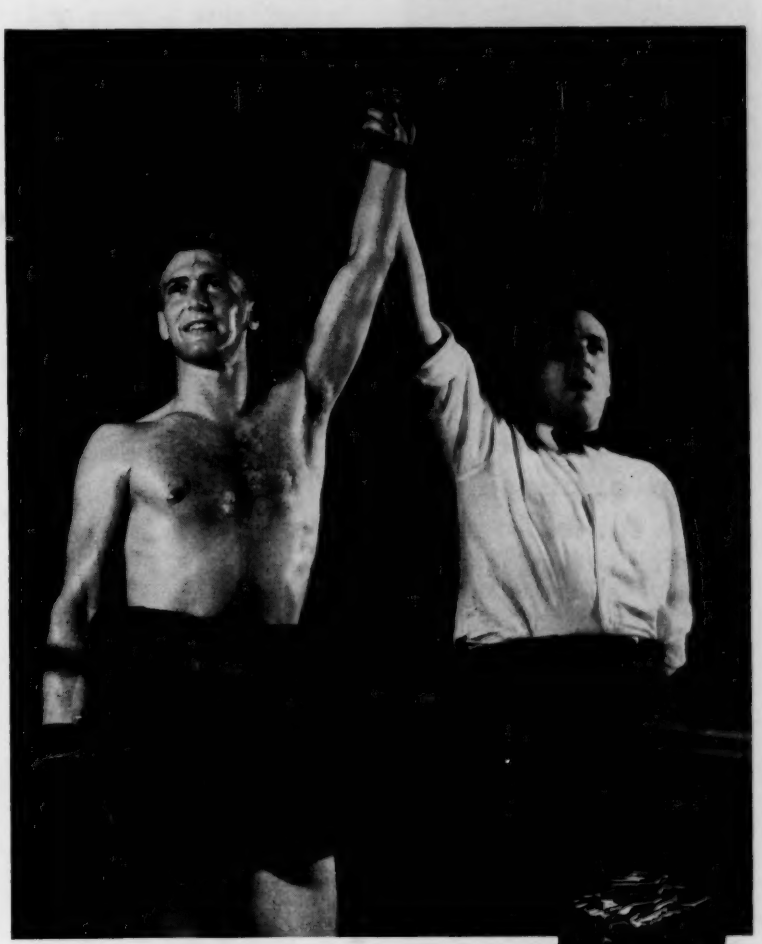
Depending on the type of pilot chosen, the delivery pressure is changed by one up to 2-2/3 psi for each 1 psi change in air loading pressure.

Cast iron, cast bronze and cast steel pilots are available to handle maximum initial pressures as high as 600 psi, and temperatures up to 500°F. All pilots have bronze diaphragms.

(Air-loaded pilots are development of Spence Engineering Co., Inc., Dept. P&PSE, Walden, N.Y.)

Circle 9350 opposite back cover.

IT'S *the decision* THAT COUNTS



...with a fuel, too!

B&O bituminous merits your winning decision for sensible plant operating reasons. (1) Volume supply in wide variety is a sure bet to outlast current competitive fuels. (2) Sources are nearest to major consumption—always dependable. (3) Mining and burning developments continually tailor bituminous to greater efficiency. Bet on B&O Bituminous! ***Ask our man!***

CONSULT COAL TRAFFIC DEPARTMENT, B & O RAILROAD
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BALTIMORE & OHIO RAILROAD
BITUMINOUS COALS FOR EVERY PURPOSE

For more information, circle 9351 opposite back cover.

AIRETROL

automatic tube expansion control

rolls ¼"-1½" O.D. tubes pneumatically faster than you ever thought possible. Average worker easily rolls up to 12 tubes per minute.

Here's why . . .

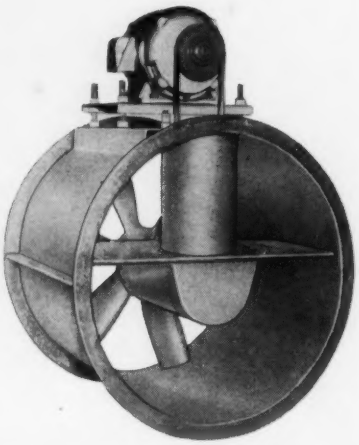
Operator dials desired torque in ft.-lbs. on micrometer head. Precision torque-sensing mechanism automatically stops expansion at this setting . . . maintains .001" accuracy consistently. Result? More work per man-hour, operator error eliminated. Write for Bulletin No. 64 or plant demonstration.

BRANCH OFFICES: New York, Chicago, Tulsa, Philadelphia, Houston, Baton Rouge.
REPRESENTATIVES: in principal cities of U.S.A., Canada, Mexico, South America, England, Europe, Puerto Rico, Italy, Japan, Hawaii.
EUROPEAN PLANT: Vlaardingen, The Netherlands
CANADIAN PLANT: Brantford, Ontario

Circle 9352 opposite back cover.

For corrosive areas — fiber-glass duct fans

Available in 12, 16, 20, 24, 28 and 36 inch diameters, line of fiber-glass duct fans under many conditions offer resistance to corrosion equal to or exceeding that of corrosion-resistant metals.



Fiber-glass duct fans have stainless steel drive shaft and hardware

The propeller, duct section, drive housing and bearing cover on these fans are made of fiber-glass; drive shaft and hardware are stainless steel.

These fans offer same features as standard belt-driven units including variable-pitch drives which allow quick, easy adjustment of fan speed.

(Fiber-glass duct fans are manufactured by Hartzell Propeller Fan Company, Dept. P&PSE, Piqua, Ohio.)

Circle 9353 opposite back cover.

Makes any kind of floor non-slippery; lasts a long time

Floor coating can be used both inside and outside

A non-skip compound that "stays down" on industrial surfaces for longer-lasting safety is made of grit-impregnated bonding resin. Designed for both inside and outside application on stair treads, floors, ramps and slopes, and around machinery, it can be used on concrete, wood, or metal.

Light consistency of the bonding material permits rapid brush or roller coverage with abrasive added in increments to the compound while still wet. In average warm temperatures, the floor is ready for light traffic in six hours after application — for heavy traffic in 16 hours.

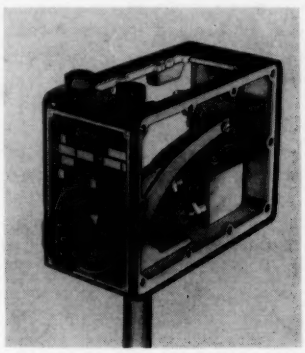
When fully cured, the compound resists grease, oil, dilute acid, alkalies and common solvents. It is available in black, gray, yellow and red, packaged in two-quart and two-gallon kits.

("Dura-Grip" is manufactured by Mine Safety Appliances Company, Dept. P&PSE, 201 N. Braddock Ave., Pittsburgh 8, Pa.)

Circle 9354 opposite back cover.

Controls temperatures up to 2000°F

Differential expansion type temperature controller is suitable for operation at temperatures up to 2000°F. Essentially a temperature transmitter, it provides air pressure proportional to temperature and is used for direct operation of air operated diaphragm valves, motors, dampers, or similar equipment.



Can be used as controller or as high temperature unit

Pneumatic unit can be used either as a controller or as a high temperature limit.

The air system includes a rugged but accurate pilot valve of the bleed type. Supply air at pressure up to 50 pounds is connected to the inlet.

Unit has a heavy cast aluminum housing and gasketed side plates to be used in any location.

(Model OA pneumatic temperature control is development of Burling Instrument Company, Dept. P&PSE, Chatham, N.J.)

Circle 9355 opposite back cover.

Shows refrigeration system failure or inefficiency before temperature rise

Electronic device is designed to keep a constant watch over a refrigeration or air conditioning system and to signal the operator at the first sign of equipment failure.

In some cases, such as a slow refrigerant leak or very inefficient compressor, it is reported that the device will signal that service is required up to months in advance of the actual equipment failure.

Since there are a few conditions

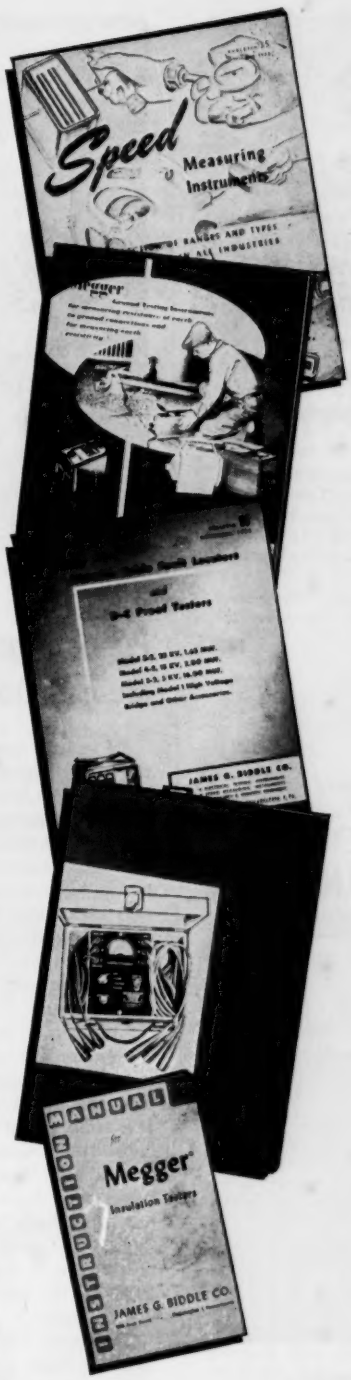
Gives early detection of refrigerant leaks, compressor or motor failures

which the device cannot detect and signal before a temperature rise, special low voltage thermal switches are made available which can be located in the refrigerant space and connected to the device so that it will also signal a temperature rise. The thermal switches are designed to prevent false alarms during defrost periods.

The electronic sentry device consists of a sensing probe which is located in the liquid line of the refrigeration system, and a main electronic control unit. A multiple selector switch which permits up to five condensing units to be connected to a single device and a low voltage remote alarm light are also available. The remote alarm light is designed for location in an area where it is certain to be seen.

(Electronic detector is development of Televance Corp., Dept. P&PSE, PO Box 3043, St. Louis 23, Missouri.)

Circle 9356 opposite back cover.



PRACTICAL HELP FOR MEN CONCERNED WITH ELECTRICAL MAINTENANCE

Biddle literature and Biddle Instruments are the universally accepted tools for preventive maintenance programs—they are integral parts of electrical operations everywhere.

Many thousands of copies of the manuals and technical publications, prepared by our engineering staff, are supplied annually to men in industry. In-plant training programs, engineering and trade schools include these down-to-earth discussions of electrical resistance and speed measuring techniques in their courses.

No File Complete Without These Useful Publications

If you are concerned with the maintenance of important electrical equipment, your files should include practical, dependable information on these subjects:

Insulation Resistance Testing **Manual 35-PI**

Earth Resistance Testing **Bulletin 65-PI**

Motor & Phase Rotation Testing **Bulletin 80-PI**

Cable Fault Locating **Bulletin 25-PI**

Speed Measuring **Bulletin 21-J-PI**

Simply list on your company letterhead any or all of these bulletins you would like mailed to you. We will see that you receive regularly Biddle Instrument News.

B-913

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Electrical Testing Instruments • Speed Measuring Instruments
Laboratory & Scientific Equipment
1316 ARCH STREET, PHILADELPHIA 7, PA.

Circle 9411 opposite back cover for item desired.

Vibratone HORNS ARE BETTER because— they are

EASIER TO INSTALL!

Easier installation means less costly installation. Easier installation promotes better workmanship. Contractors prefer *Vibratones* because they require no special tools or fittings, because they attach readily to any outlet box, and because they involve no tuning or complicated adjustment.

This is but one of dozens of advantages of the *Vibratone* over other horns. *Specify FEDERAL Vibratones on your signal installation. Investigate.*
Ask for bulletin #105.

FEDERAL SIGNAL SIGN and Corporation

13609 S. Western Ave. Blue Island, Ill.

Circle 9357 opposite back cover.

NEW AIR-CONDITIONING AID

Keep air-flow coils new-clean with METALENE

- Non-flammable, non-toxic.
- Non-corrosive, prevents rusting.
- Approved safe for food and drug plants.
- Non-volatile, harmless to paint.
- To clean cooling coils and permanent filters: Spray on Metalene, rinse off using garden hose. Restore factory newness to cooling coils and filters in 15 minutes with METALENE.

Write for descriptive literature to

LESTER LABORATORIES, INC.

Post Office Box 4897 Atlanta 2, Georgia

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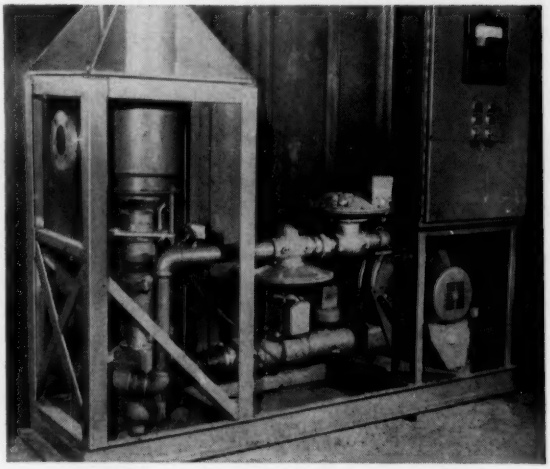


For heating gases, vapors, liquids up to 1000°F

Pre-packaged fired heaters are easy to install

To reduce time and cost of installing fired heaters in the field, units are now available pre-packaged from the factory. All combustion, flame safety and automatic control equipment are mounted in position, wired and ready for operation. This permits faster, easier installation and eliminates engineering since the user only needs to mount the heater on the combustion section and make one fuel and electrical connection.

"Packaged" feature also eliminates costly parts assembly as no time is lost on the job in laying out, purchasing and hooking up pipe fittings, valves, wiring and controls. Trouble-free operation is assured, with no danger of faulty hookups.

Heaters are used for efficient, economical heating of a wide variety of gases, vapors and liquids up to 1000°F with capacities ranging from 100,000 Btu/hr in a 2½" IPS tube to 1,000,000 Btu/hr in a 10" IPS tube. Large capacities are available utilizing multiple tubes. Typical uses are as heaters for asphalt, bunker C oil, chemical gases and liquids, steam superheaters, heat transfer oils, and high temperature salt solutions.

Heat is transferred from finned combustion tube to product by means of patented fins which provide up to 10 times the surface area on the outside of the tube as on the inside.

Fins permit heat to be removed from the fintube so fast that tube wall or "skin" temperatures are substantially lowered. Heater life is substantially increased by reducing the danger of metal fatigue, corrosion and oxidation which occurs when bare tubes with high metal temperatures are used.

Pre-packaged fired heaters are available in a variety of heater and panel positions, that meet practically any installation requirements. Heaters may be installed horizontally, or can be mounted vertically to save floor space.

(Pre-packaged heaters are development of Brown Fintube Company, Dept. P&PSE, 300 Huron Street, Elyria, Ohio.)

Circle 9359 opposite back cover.

Get longer cement lining life in hoppers, induced draft fans

The cement linings in fly-ash hoppers and induced draft fans are subjected to vibration, erosion, abrasion, corrosion and temperature changes — all of which tend to shorten the lining's life.

A metal honeycomb mesh has been developed to prevent lining failure under such conditions. The basic function of this "grid" is to pre-crack the surface of the cement with a series of hexagonal steel cells. This stress relieves the filler so that inherent stress — instead of causing cracks — is transferred to the outside of each hexagonal cell. Consequently spalling cannot develop.

The material is made of carbon or stainless steel bars, ¾" or 1" by either 14 or 12 gauge. These bars are formed and fastened together, on edge, by means of integral lugs, to provide a honeycomb. The bars are perforated to permit the castable material to flow through the openings from cell to cell so as to form a homogeneous mass.

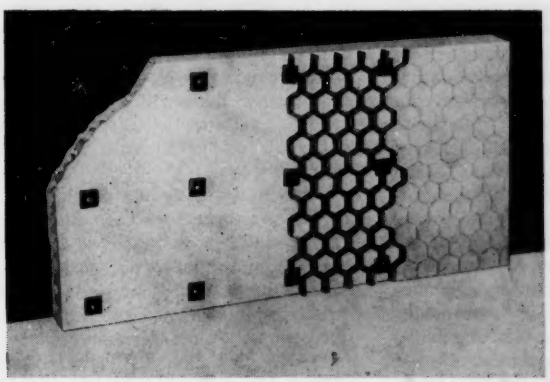
The grid is available in two forms: The shell type is welded directly to the shell of the unit. With this type, every sixth bar is deeper than the others, and it is undercut at frequent intervals to permit the flow of cement to adjacent cells and to reduce to a minimum the heat transference to the shell.

The other (or standard) type is designed for thick linings. This type is welded to studs which have been welded to the shell, leaving a space between the grid and shell equal to the required thickness for insulation. Into this space is gunned the insulation. The grid is then filled with a hard-wearing cement, leaving the upper edges of the bars exposed.

The product is stocked in panels 10 by 3 ft, but can be furnished in various sizes. The panels may be rigid or flexible. The flexible panels may be curved by hand on the job into various radii down to 1¾ ft.

("Gridsteel" is product of Irving Subway Grating Co., Inc., Dept. P&PSE, 50-39 27th St., Long Island City 1, N.Y.)

Circle 9360 opposite back cover.

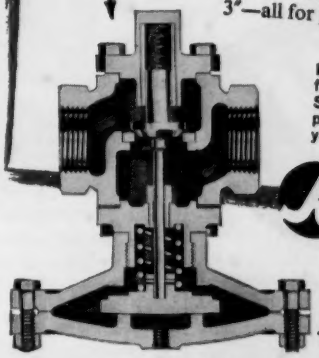


Use of hexagonal grid will lengthen life of cement linings. For a thick lining, the grid is welded to studs welded to the shell. Space between grid and shell is filled with insulation, and a hard-wearing cement is applied

Valve assembly floats

...in this JOHNSON DIAPHRAGM VALVE

Yes, this diaphragm valve has the same floating-action valve assembly perfected in Johnson Solenoid Valves. Valve seat is not tied to push rod...is free to find its own leak-tight seat with each closing. Ideal for steam and water service. Designed especially to team up with Johnson Solenoid Valves ...to provide a quick-acting, heavy duty automatic valve for high-pressure large-capacity requirements. Sizes 2", 2½" & 3"—all for pressures to 250 psi.

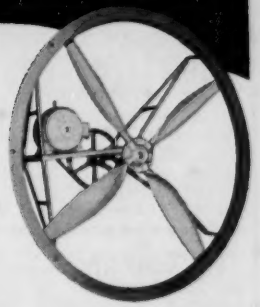


New Bulletin "V" has full data on Johnson Solenoid and Diaphragm Valves; write for your copy.

THE JOHNSON CORPORATION
807 Wood Street
Three Rivers, Michigan

Circle 9361 opposite back cover.

Why Buy 3 Fans When 1 Will Do the Job?



When you've got a big job to do, use a big fan to do it. Hartzell Low-Speed, High-Volume Fans can handle your big air-moving jobs with amazing economy because one of these big fans will do the work of several smaller units.

For example, one 94" Hartzell Low-Speed, High-Volume fan will move 174,000 CFM at free air (or 157,000 against ¼" static pressure). And if that's not enough, Hartzell can supply other models up to 22' in diameter.

And these heavy-duty Hartzell fans are practically maintenance free because they're specifically designed for demanding industrial applications.

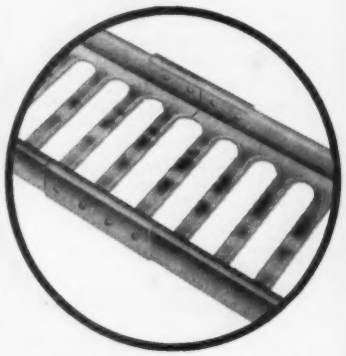
For complete details, call your nearby Hartzell field office or write for Bulletin A-109.

HARTZELL PROPELLER FAN CO.
Div. of Castle Hills Corp.
52 Thomas Blvd., Piqua, Ohio — A member of AMCA

Circle 9362 opposite back cover.

Save Time, Money Speed Installations with . . .

P-W Cable Supporting Systems



P-W's type "E" (punched bottom) trays — for power and control cables and instrument tubing — altho less expensive, are stronger, versatile and superior. Control cable can be dropped out anywhere.

Engineers, Contractors and Installers look for QUALITY, LONG LIFE, AND LABOR SAVINGS in their supports. That's why more and more users are turning to P-W. Among our oustanding improvements are: CONNECTIONS that are quick and easy to install — PRE-CUT SYSTEMS saving installation time — EXTENSION CONNECTORS eliminating field cutting to complete runs — ADJUSTABLE HORIZONTAL and RISER CONNECTORS to go over, under or around pipes, trusses, columns, etc. — BUILT-IN ADJUSTABLE DROP-OUT SECTIONS eliminate cutting out bottom of tray — STRAIGHT SECTIONS available in lengths up to 16′ (33 1/3% less connectors and less installation time over 12′ lengths).

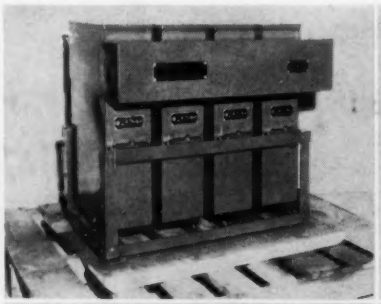
P-W SUPPORTS are available in hot dip galvanized steel or aluminum, in LADDER, EXPANDED METAL and SOLID TRAYS in addition to Type "E". All systems are interchangeable. Write for Catalog 858-A.

For the utmost in service, contact the appropriate Representative in your territory or P-W direct, regarding inquiries and placing orders.

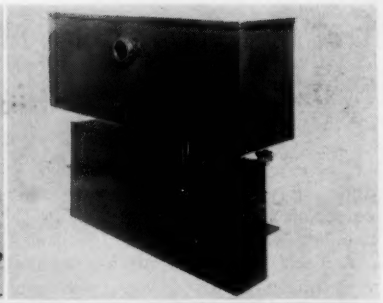
P-W **INDUSTRIES, INC.**

11200 Roosevelt Blvd.
Philadelphia 15, Pa.

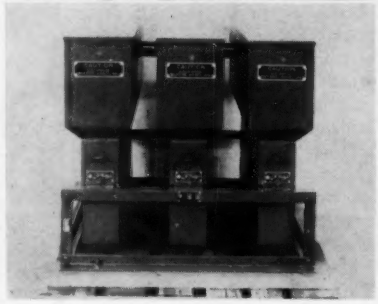
Circle 9363 opposite back cover.



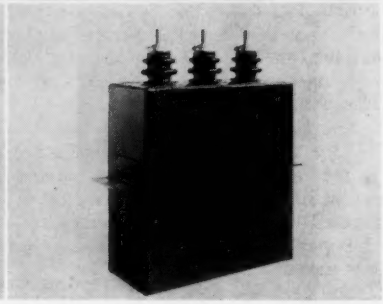
Top left—Typical low-voltage power capacitor assembly designed for indoor use. (Units also available for outdoor use)



Top right—Typical high-voltage power capacitor unit designed for indoor use. (Units also available for outdoor use)



Bottom left—High-voltage capacitor unit mounted on rails. Available in combinations up to 150 kvar. Pipe connections provide water-tight duct for interconnection of individual units



Bottom right—Basic capacitor unit, with enclosure removed, as engineered to equipment manufacturer specifications. Rated from 230 up through 600 volts

Low-cost capacitors correct power factor

— pay for themselves quickly where plant inductive loads are heavy

Flexible, low-cost power capacitors enable industrial users to get all the power they buy — by correcting power factor and thus eliminating power otherwise used to offset the reactive component of the load. Easy-to-install capacitors are particularly useful in plants where heavy inductive loads (induction motors, welding equipment, transformers, etc.) usually overload power lines and lower voltages to an extent that operation of connected equipment is adversely affected.

Power capacitors are available for both low-voltage and high-voltage systems. Low voltage units are rated 240, 480, and 600 volts, 60 cycle, with kvar ratings from 5 through 25. They can be used individually or assembled in banks of 2 to 6 units mounted on rails, complete with connecting ducts and wiring.

Exclusive high-voltage industrial power capacitors are available for 2400 volt and 4160 volt, 60 cycle Delta systems.

Both low-voltage and high-voltage units can be furnished in dust-tight containers suitable for indoor use or in weatherproof units for outdoor use.

All capacitors are impregnated with non-inflammable and non-explosive Dykanol "L" and come individually enclosed in hermetically-sealed steel containers. For safety, they feature high interrupting fuses as well as discharge re-

sistors which provide an additional safeguard by reducing residual charges. When delivered, they are completely fused and wired, ready for immediate installation.

Units meet both NEMA and ASA standards. An exclusive energization test prior to shipment subjects all units to a full-voltage "heat-run" for a predetermined number of hours, simulating conditions met in the field.

(Power capacitors are offered by Federal Pacific Electric Co., Dept. P&PSE, 50 Paris Street, Newark 1, New Jersey.)

Circle 9364 opposite back cover.

Oil-bath air cleaner for engines has no moving parts

Replacing the motor-driven oil circulator with a pneumatic oil lift, oil-bath air cleaner for engine intake on gas and oil transmission lines eliminates need for electrical power. With this design, the cost of installation and maintenance has been materially reduced.

Air cleaner uses pneumatic oil lift instead of motor to bring oil from reservoir to distribution plate

The pneumatic lift is a simplified method of lifting oil from the reservoir to the perforated oil distribution plate, which in turn distributes the oil to the pads. No special protection is needed for hazardous locations.

Other changes in the unit include a new cleanout door for easier maintenance, the addition of a bullseye gage to observe and help control the oil level in the unit, and the elimination of studs sticking out of the top of the unit.

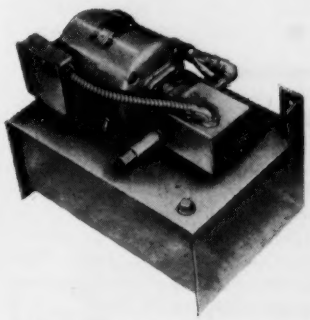
(Model "C" PO1 Type Cycoil oil-bath air cleaner is manufactured by American Air Filter Company, Inc., Dept. P&PSE, 215 Central Ave., Louisville 8, Ky.)

Circle 9365 opposite back cover.

Hydraulic power package for wide range of equipment

A low-cost hydraulic power package combines compact design with high-level lift ability.

Designed and constructed for dependable, maintenance-free service through long periods of time, the package provides 1½ gpm output at 2000 psi. This power is readily adaptable for press duty, machine feeds, lift tables or any other service in a wide range of industrial equipment.



Unit provides 1½-gpm output at 2000 psi

Designed to meet requests for reliable power package at low cost, the unit incorporates features to assure maximum performance. A precision gear-pump is directly coupled to a special-design electric motor capable of producing up to 3 hp output at its duty rating.

Also built in are adjustable relief valves, ball-check valves and removable-screen suction-filters mounted on a 4½-gallon reservoir.

Optional accessories include a solenoid-controlled one-way return valve with built-in pressure-compensated flow control.

("Auto-Power" unit is manufactured by Autoquip Corporation, Dept. P&PSE, 1140 South Washtenaw, Chicago 12, Illinois.)

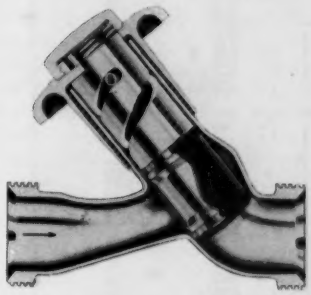
Circle 9366 opposite back cover.

Seatless sanitary valve is quick-acting

Body of seatless sanitary valve is fabricated from flat polished stainless steel sheets, thereby eliminating porosity. Molectric treatment of the body provides greatly increased corrosion resistance.

A synthetic rubber material—nontoxic, odorless and tasteless—is used for the sealing element which, except for the body, is the only part having contact with material flowing through.

The sealing element is a simple, easily removed, effective seal which provides leakproof performance and



Sanitary valve can be disassembled and cleaned without tools

reduces valve wear from abrasion. These elements are available in compounds that resist the action of air and other products such as gasoline, oil, and chemicals over a temperature range from −60°F to 300°F.

In most cases, they need no lubrication other than that from the flowing fluid.

The valve is easily cleaned, light in weight and has full flow-through with minimum pressure drop and minimum turbulence and areation. Actuating mechanisms are interchangeable in line, angle, tank and gravity flow valves of the standard quick-acting type.

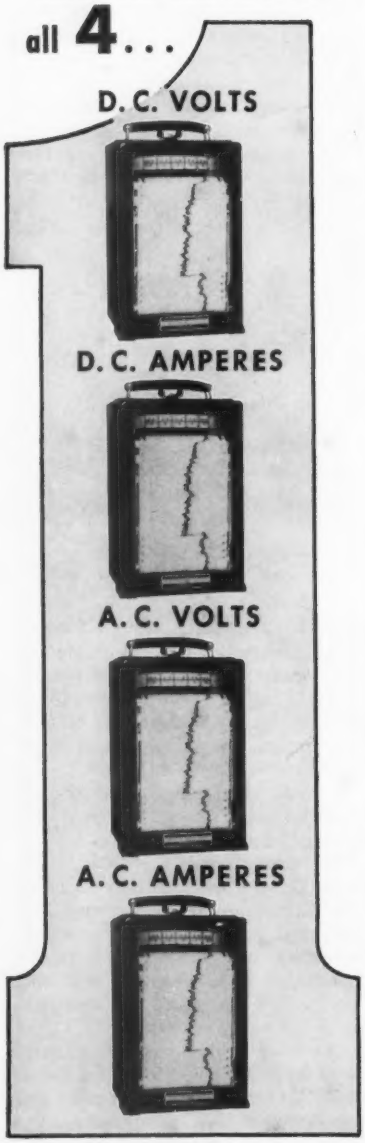
(Sanitary valves are manufactured by Stehlin Corporation, Dept. P&PSE, 1724 South Los Angeles St., Los Angeles 15, California.)

Circle 9367 opposite back cover.

For more information on items reported in the New Developments section circle corresponding numbers on reader service card opposite inside back cover.

MORE FOR YOUR MONEY

This 1 Esterline-Angus Multi-Purpose Recorder measures and records all 4...



Also available in various combinations of the above. Write us your requirements or send for Catalog Section 48.

THE
Esterline-Angus
COMPANY

No. 1 in fine Graphic Instruments for more than 50 years.

DEPT. M, BOX 596, INDIANAPOLIS 6, INDIANA

Circle 9368 opposite back cover.

NEW LITERATURE

For effective plant and power services operation

Reviews of books and industrial bulletins describing equipment, supplies and services

Aluminum roof coatings

Application details and specifications on aluminum roof coatings are described in 8-page brochure. Coating is said to offer greatly increased roof protection, adhesive qualities, and interior building cooling due to four new ingredients — banoxol, pliogar, microtex, and fiber glass.

The coatings are recommended as weather-proof coatings and building coolants over new or old roofs of felt, composition, corrugated or metal.

(Aluminum Roof Coatings Bulletin is issued by The Gariand Co., Dept. P&PSE, 3748 E. 91st Street, Cleveland 5, Ohio.)

Circle 9369 opposite back cover.

Demineralizer bulletin

Demineralizer bulletin contains information on the use of demineralization process eliminating variables in water and their effects on product quality control.

(Bulletin No. 5819 is available from Cochrane Corp., Dept. P&PSE, 17th Street Below Allegheny Avenue, Philadelphia 32, Pa.)

Circle 9370 opposite back cover.

Variable-speed sheave bulletin

Stationary control variable-speed sheave for standard V-belts is described in 8-page bulletin.

The patented, positive-locking sheave is available with two, three, or four grooves. Bulletin covers its non-freezing construction, method of installation, easy speed change and other features. An "exploded" view shows and labels the various components.

Tables are given to aid in the proper selection of variable-speed sheaves and companion sheaves.

(Bulletin 6102 is issued by T. B. Wood's Sons Company, Dept. P&PSE, Chambersburg, Pa.)

Circle 9371 opposite back cover.

Condensation pumps bulletin

Twelve-page bulletin on condensation pumps features six models and includes design features, general specifications, engineering data, dimension drawings, construction and operation details and a check list to follow in the selection of a pump.

Data and drawings pertain to both single and duplex units.

(Bulletin No. CP-600 is issued by American Air Filter Co., Inc., Dept. P&PSE, 215 Central Avenue, Louisville 8, Kentucky.)

Circle 9372 opposite back cover.

Dry collection equipment for dust control

Dust control bulletin describes complete range of dry collection equipment. Shown are ways of using cloth filtration and cyclonic equipment for eliminating dust control and air pollution problems in industry.

Illustrated application data shows how industry uses this equipment effectively to collect waste dust or to return valuable reusable material to the manufacturing process.

(Bulletin No. 805 is available from Dracco Division of Fuller Company, Dept. P&PSE, Harvard Avenue & East 116th Street, Cleveland 5, Ohio.)

Circle 9373 opposite back cover.

Diesel-electric power house

Recently erected diesel-electric power houses in many parts of the world are described in pamphlet.

Printed in four languages (English, German, French and Spanish) the pamphlet has many photos and also a complete power house layout drawing for a typical three power unit installation.

(Pamphlet is available from Diesel Energy Corp., Dept. P&PSE, 82 Beaver Street, New York 5, N.Y.)

Circle 9374 opposite back cover.

Vertical gear reducers and in-line reducers

Vertical gear reducers and in-line reducers are dealt with in 28-page catalog.

Catalog is a complete selection guide. It describes the construction and mechanical features of motor reducers in eight housing sizes for applications up to 125 hp and output speeds of 9 rpm to 420 rpm.

Load characteristics are outlined, including horsepower and torque ratings, overhung loads and maximum allowable thrust loads. Also covered in the catalog are complete mounting dimensions and parts lists for each type of reducer listed.

(Catalog MR-58 is issued by Philadelphia Gear Corp., Dept. P&PSE, 3620 "G" Street, Philadelphia 34, Pennsylvania.)

Circle 9375 opposite back cover.

Rubber-seated butterfly valves

Rubber-seated butterfly valves are described in 36-page catalog. Designed in accordance with American Water Works Association specifications, and for hydrostatic operating pressures up to 125 psi and velocities, the valves can be operated manually, or by motor operators, pneumatic cylinder operators, hydraulic cylinder operators, diaphragm and float operators — or by other special methods upon request.

(Bulletin No. 5904 is available from Darling Valve & Mfg. Co., Dept. P&PSE, Williamsport 28, Pa.)

Circle 9376 opposite back cover.

Analyzer for continuous O_2 measurement

Bulletin describes a unit for the continuous measurement of O_2 in gases that has automatic temperature compensation, yet uses no chemicals and has no moving parts.

With an accuracy of $\pm 1\%$ to 2% of full scale and a stability of $\pm 1\%$ of full scale over more than a year, the analyzer provides accurate data for efficient fuel burning, permits economical ceramic firing and closer control of kiln atmospheres.

(Bulletin 1059 is issued by Milton Roy Company, Dept. P&PSE, 1300 Mermaid Lane, Philadelphia, Pa.)

Circle 9377 opposite back cover.

Multi-pointer gage unit

Four-page specification sheet describes multi-pointer gage units, used for pressure and level measurements, and pneumatic transmitting or receiving.

(Product Specification M42-2 is issued by Bailey Meter Co., Dept. P&PSE, 1050 Ivanhoe Road, Cleveland 10, Ohio.)

Circle 9378 opposite back cover.

Adapting thermocouples

Spring-loaded bayonet-lock thermocouple adapter converts any ⅛" or 1/16" diameter metal-sheathed thermocouple to a spring-loaded, bayonet-lock type with adjustable immersion lengths.

Applications and specifications are included in 2-page bulletin.

(Bulletin NO. 2A is available from Thermo Electric Co., Inc., Dept. P&PSE, Saddle Brook, N.J.)

Circle 9379 opposite back cover.

Corrosion inhibitor protects cooling, heating systems

Corrosion inhibitor, designed to protect low make-up closed cooling and heating systems, is subject of illustrated 6-page bulletin.

Compatible with solutions of alcohol and glycol-base antifreeze, the inhibitor controls corrosion by producing a protective film on all exposed metal surfaces, including iron, steel, copper, copper alloys, aluminum, brass and solder.

Bulletin recommends the non-chromate, non-staining product for air conditioning systems, nuclear reactors, high-temperature hot water systems, diesel and gas engines, compressors, process cooling water systems, rectifier cooling systems, low-pressure (low make-up) steam boilers, systems in standby, heat pumps, truck and automobile radiators, and ice melting systems.

(Bulletin HSP-922 is issued by Hagan Chemicals & Controls, Inc., Dept. P&PSE, Hagan Building, Box 1346, Pittsburgh 30, Pa.)

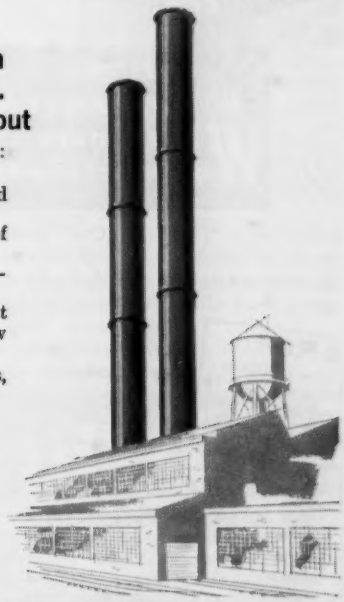
Circle 9380 opposite back cover.

unless you're equipped with
A. O. Smith smokestacks . . .
glass-protected inside and out

Glass-protected smokestacks give you:

- A selection of colors
- 3 to 5 times longer life than unlined steel stacks
- Corrosion resistance regardless of excess acid condensate
- Low maintenance, no painting — glass can't rust
- Light weight—lower foundation cost
- Lower cost — glass protection now within reach of all

For bulletin containing all the facts, write Dept. CE-40.



Through research ... a better way

A.O.Smith
CORPORATION
SMOKESTACK SALES
PROCESS EQUIPMENT DIVISION
P. O. BOX 584 • MILWAUKEE 1, WISCONSIN

For more information, circle 9381 opposite back cover.

WILCOX Self-Sealing GASKETS

Their outstanding performance over the years proves that you can depend on WILCOX Self-Sealing Gaskets for holding power in your lines.

The U-Shaped metal outer cover is packed with a resilient filling, usually rubber or asbestos. Pressure exerted on this filling forces it into the cover, putting force against adjacent flange surfaces. Thus pressures that tend to blow ordinary gaskets make the Wilcox tighter.

Available with covers of copper, lead, tin, aluminum, monel, stainless steel, etc. in all sizes, standard or special.

Write for Bulletin No. 569 and prices

CHICAGO-WILCOX MFG. CO.
7725 So. Avalon Avenue
Chicago 19, Ill.

Circle 9382 opposite back cover.

WORN DANGEROUS STAIRS MADE NEW AGAIN—

In One Day . . .

Outwears Concrete, Stone or Marble

SUPER STAIRMASTER
NEW Aluminum Safety Treads

Brand new "TRAFFIC-FLOW" design. Made of heavy-duty, non-corrosive aluminum alloy base. Filled with diamond hard abrasive. Non-slip under oil or grease. Easy to clean. Fits tightly, securely, over all types of stairs.

FREE new bulletin shows how to repair stairs GET DETAILS

Guaranteed by Warranty Bond

Wooster Products Inc. Dept. S-19
1000 Spruce St., Wooster, Ohio
NAME_____TITLE_____
COMPANY_____
ADDRESS_____
CITY_____STATE_____

Circle 9383 opposite back cover.

Motorized zone control valve

Motorized zone control valve for use on hydronic heating and cooling systems for steam up to 10 psi is described in bulletin.

Valve features four body types for varying job conditions. It has a visual valve stem indicator, and can be set for manual operation in case of power failure.

Valve has 100% shut-off feature, allowing it to be used on low pressure steam systems. Angle body pattern allows flow through valve in any direction.

(Bulletin No. 1-Z-1 is issued by Cash-Acme, Dept. P&PSE, PO Box 191, Decatur, Ill.)

Circle 9384 opposite back cover.

All kinds of coatings

Industrial coatings for walls, roofs, floors and equipment are described in detail in 40-page catalog.

Types of coatings listed in the illustrated brochure include epoxy, alkyd, chlorinated rubber, polyurethane, phenolic, polyvinyl, acrylic, Pliolite, polysulfide rubber, oleoresinous, silicone and vinyl.

Such properties as drying time and coverage are included in the description of each product.

(Catalog No. 59 is issued by Steelcote Manufacturing Company, Dept. P&PSE, St. Louis 3, Mo.)

Circle 9385 opposite back cover.

Shows 22 features of portable compressor

Twenty-two features of portable rotary compressor are pictured in four-page bulletin. Sliding vane type, two-stage unit delivers 125 cfm of air at 100 psi at 1600 rpm. Compressor weighs only 2280 pounds.

Features pictured and explained include 100% modulating control, one-valve operating pressure change, thermo-by-pass valve, air receiver safety valve, high air temperature safety switch, automatic "dump" valve and a low engine oil cut-off switch.

(Bulletin P123C is issued by Le Roi Division, Westinghouse Air Brake Company, Dept. P&PSE, Milwaukee 1, Wisconsin.)

Circle 9386 opposite back cover.

Industrial hose, fittings, couplings catalog

Thirty-eight page catalog describes hose, fittings, and self-sealing couplings. Hose selector chart lists the various applications and fluids for which specific hose types are recommended.

Catalog includes specifications for products for use on general industrial applications such as plant machinery, mobile equipment, oil field machinery, and stationary power plants.

(Catalog No. 204 is issued by Aeroquip Corp., Dept. P&PSE, Jackson, Mich.)

Circle 9387 opposite back cover.

Sewage plant effluent for boiler purposes

Sewage plant effluent can be used satisfactorily in recirculating cooling systems and as boiler makeup provided it is adequately treated to avoid operating problems such as organic growths, deposits and corrosion in cooling systems and foaming, carryover and ammonia corrosion in boiler and steam systems.

Some of the water treatment problems which have been encountered in the actual use of sewage effluent as an industrial water source are discussed in technical paper.

(Technical Paper No. 138 is available from Betz Laboratories, Inc., Dept. P&PSE, Gillingham & Worth Streets, Philadelphia 24, Pa.)

Circle 9388 opposite back cover.

Molded case circuit breakers announced

Three molded-case circuit breakers are introduced in six-page bulletin. The models are rated 100 amps, 240 volts (symmetrical terminal); 100 amps, 480 volts; and 400 amps, 600 volts.

The bulletin gives complete selection, application and ordering information together with illustrations and outline drawings.

(Bulletin GEA-7070 is issued by General Electric Company, Distribution Unit, 90 Whiting St., Plainville, Connecticut.)

Circle 9389 opposite back cover.

Air gage catalog

Precision air gaging instruments, elements and related accessory equipment are featured in 16-page catalog.

Featured are single and multiple column air gaging instruments equipped with a "Multi-Amp" tube which permits conversion from one amplification to another simply by changing calibrated scales.

Standard air gage elements include "Normal" and "Reverse" type cartridges in both short and long range models, open orifice and contact type spindles, true and average type air gage rings, and both open orifice and contact type air gage snaps.

(Air Gage Catalog is issued by Dearborn Gage Co., Air Gage Div., Dept. P&PSE, 32330 Ford Road, Garden City, Michigan.)

Circle 9390 opposite back cover.

Industrial heat exchanger specification sheet

Selection data form enables engineers to obtain exact information regarding the most efficient size and type of heat exchanger required for a particular operation.

Included is a description of a package regenerative air preheater designed for industrial process or boilers in a range from 25,000 to 250,000 pounds per hour; recuperative type heat exchangers engineered for high temperature, high pressure applications where leakage cannot be tolerated; and a compact rotary regenerator available in a range of sizes starting as small as 20″ in diameter.

(Industrial Heat Exchanger — Selection Data Form is issued by The Air Preheater Corp., Dept. P&PSE, 60 E. 42nd St., New York 17, N.Y.)

Circle 9391 opposite back cover.

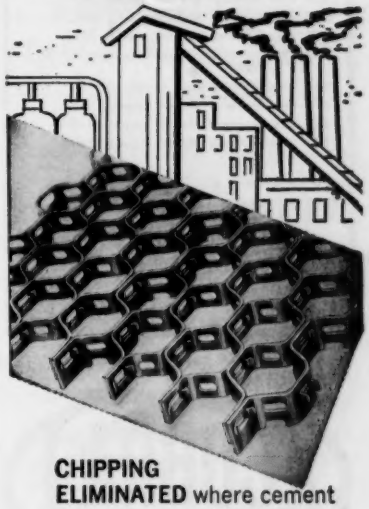
"Now it gives a much steadier reading since I dissolved two aspirins in the recording ink!"

GRIDSTEEL®

GREATLY REDUCES MAINTENANCE of cement linings in

★ **INDUCED DRAFT FANS**

★ **FLY ASH HOPPERS**



CHIPPING ELIMINATED where cement surfaces are subject to vibration, erosion, temperature changes, and abrasion.

STRESS RELIEVED CEMENT is obtained by the pre-cracking effect of using GRIDSTEEL hexagonal mesh ¾″ or 1″ deep. Gridsteel transfers the stress to the outside of the hexagonal cells.

ECONOMICAL thru low cost and ease of installation.

GRIDSTEEL is available from stock.

SEND NOW for full information and catalog.

IRVICO

IRVING SUBWAY GRATING CO., Inc.
Originators of The Grating Industry Est. 1902
Offices and Plants at:
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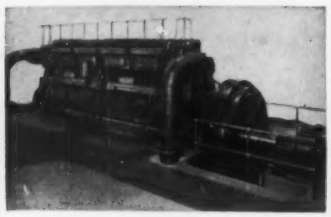
1828 10th St., OAKLAND 20, CALIFORNIA

Circle 9392 opposite back cover.

DIESEL ENGINE GENERATOR SETS

Immediate Delivery from Inventory!



Any voltage; 50 or 60 cycle. Available in stationary, mobile or portable model. Following listing is only partial.

1420 kva Fairbanks-Morse model 38D—8⅛ (photo above)
1375 kva General Motors model 278A
1250 kva General Motors model 567
938 kva General Motors model 567
625 kva General Motors model 278A
625 kva American Locomotive Co. model 539
412 kva Worthington model CC
375 kva General Motors model 268A
312 kva General Motors model 268A
250 kva General Motors model 268A

A. G. SCHOONMAKER Company, Inc.

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Circle 9393 opposite back cover.

COBRA® FLEXIBLE SEAMLESS METAL HOSE

Custom constructed assemblies for industrial power systems

All sizes in bronze, stainless or carbon steel, monel, inconel and low carbon nickel. Seamless spiral or parallel corrugation...Braided. All type of fittings and flanges welded, brazed or soldered. Also, interlocked hose.

write — wire — phone: RE 7-3311
...for prices and catalogs

COBRA METAL HOSE

5059 S. Kedzie Ave. • Chicago 32, Ill.

Circle 9394 opposite back cover.

NEW LITERATURE

Spherical roller bearings

Spherical roller bearings combine maximum diameter and quantity of convex rollers for each bearing size with precision machined centrifugally-cast bronze retainers and high, heavy inner race shoulders.

Fifty-two page book describes all design features, including comprehensive selection data and formulas, shaft bearing seat diameters, lubrication information, shaft details and bearing load ratings, diagrams, photographs and charts.

(Book 2760 "Spherical Roller Bearings and Pillow Blocks" is available from Link-Belt Company, Dept. P&PSE, Prudential Plaza, Chicago 1, Ill.)

Circle 9395 opposite back cover.

Explains construction, air filter application

Construction and application of permanent washable unit air filters are covered in 12-page composite product bulletin. Air filters described include a high capacity, low resistance unit; heavy-duty metal filter; aluminum filter; spray booth filter; and special air filters.

Also included are explanations of filter maintenance methods and the equipment necessary, together with installation data. Charts, arrestance-resistance curves, engineering data, shipping weights and dimension drawings are an important part of the new bulletin.

(Bulletin No. 207 is issued by American Air Filter Co., Inc., Dept. P&PSE, 215 Central Avenue, Louisville 8, Kentucky.)

Circle 9396 opposite back cover.

Non-chattering hydro-valve for liquid service

Four-page bulletin describes non-chattering hydro-valve line for liquid service. Complete details and specifications on sizes, capacities, materials and other pertinent data are included.

(Bulletin L-100/59 is issued by J. E. Lonergan Co., Dept. P&PSE, Second and Race Streets, Philadelphia 6, Pa.)

Circle 9397 opposite back cover.

Low-cost condensate flow-regulator

Low-cost steam condensate flow-regulator can be used on veneer, paper and corrugated dryers. Designed for better drainage of dryers operating at pressures up to 300 psi, the device provides any degree of condensate flow and operates without moving parts.

(Bulletin 600 is offered by Stickle Steam Specialties Co., Dept. P&PSE, 2215 Valley Avenue, Indianapolis 18, Indiana.)

Circle 9398 opposite back cover.

Silicon power rectifiers

Eight-page, two-color bulletin describes silicon power rectifiers, which can be built to supply virtually any desired voltages and currents.

The device is a unified power conversion system consisting of a silicon rectifier unit, transformer and associated auxiliary equipment, and is used as a source of direct current power in such applications as the electrolytic production of chlorine, fluorine, copper and manganese; and for the powering of motors, and electric arc furnaces.

(Bulletin No. 6101-1A is issued by I-T-E Circuit Breaker Company, Dept. P&PSE, 1900 Hamilton St., Philadelphia 30, Pa.)

Circle 9399 opposite back cover.

Handy way to calculate ion exchange problems

With this handy slide rule, quick ion exchange calculations can be made. Starting with these known facts: local water hardness, gallons of water per day to be softened, and salt dosage level, it is possible to determine: total kilograins of hardness removed per cycle or regeneration, cubic feet of resin required, salt required for regeneration, and drawdown in circular or rectangular brine measuring tank.

On the reverse side, a slide-card table gives properties relating to brine strength.

(Ion exchange calculator is offered by Morton Salt Company, Dept. P&PSE, 110 N. Wacker Drive, Chicago 6, Illinois.)

Circle 9400 opposite back cover.

Explains safe-operating nozzle for inspirating gas burners

Improved gas burner nozzle, providing safe operation with hydrogen or hydrogen-rich gases in various furnaces, is subject of four-page bulletin. The nozzle also assures effiicient burning of any other gas including the natural or by-product types.

They produce a shorter, hotter, stable flame with a high turn-down ratio and with very low excess air in the nozzle. Standard sizes are 3, 4, 6 and 8 inches.

(Bulletin 57 is available from National Airoil Burner Company, Dept. P&PSE, 1284 E. Sedgley Avenue, Philadelphia 24, Pa.)

Circle 9401 opposite back cover.

Mass spectrometer-type leak detectors

Tables of conversion factors, formulas, performance charts, hints and other useful information for users of mass spectrometer-type leak detectors are included in 4-page brochure.

(Bulletin 1857 is issued by Analytical and Control Division of Consolidated Electrodynamics Corp., Dept. P&PSE, 360 Sierra Madre Villa, Pasadena, California.)

Circle 9402 opposite back cover.

Thermocouples bulletin

Metallic-sheathed, hard-packed, oxide-insulated thermocouples and extension wire brochure also includes various hot junctions (integrated, insulated and exposed).

Optional fittings are listed on a chart giving diameters, male pipe threads, materials, prices, etc., as well as suffix letters and price additions for the various types and adaptations.

Thermocouples with hot junctions, bare wire and open end extensions are all illustrated and listed as well as diameter sheaths from .040" to .250" with full instructions for ordering with prices for all variations.

(Catalog No. 101 issued by Research Instruments, Inc., Dept. P&PSE, 12410 Triskett Road, Cleveland 11, Ohio.)

Circle 9403 opposite back cover.

Welding electrodes pocket guide

Pocket guide on arc welding electrodes gives brief description of each electrode listed along with applications, procedures and pertinent AWS-ASTM data. Two 8-page foldouts at rear of book contain charts of recommended electrodes for welding ASTM and trade name steels, and comparison tables for mild steel and hardfacing electrodes of leading manufacturers.

In addition, the guide contains descriptive write-up of stainless steel iron powder type electrodes; electrode reconditioning guide and data on new hardfacing electrodes.

("Electrode Pocket Guide" is issued by Air Reduction Sales Company, Dept. P&PSE, 150 East 42nd Street, New York 17, N.Y.)

Circle 9404 opposite back cover.

Easy way to read surface temperature

Just by watching the melting action of a material applied to a surface, it is easy to tell the precise temperature of that surface.

When the surface reaches the desired temperature, the mark left by a stick or liquid—or a pellet—will quickly melt. Accuracy is within plus or minus 1% of stated temperature.

Four-page bulletin gives temperature ranges of and tells where to use these indicators.

(Form No. MT-200-1059 is issued by Markal Company, Dept. P&PSE, 3052 West Carroll Ave., Chicago 12, Ill.)

Circle 9405 opposite back cover.

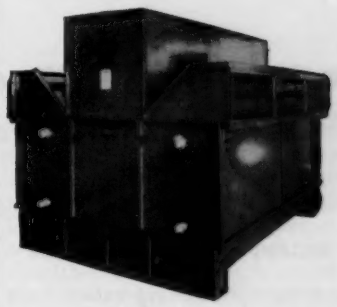
Synchronous motors are heavy duty

Heavy-duty synchronous motors rated 60 hp and up at speeds from 500-1800 rpm are described in single-page color leaflet.

The motors, suitable for standard voltage connection (60 or 50 cycle), are built in a variety of enclosures for every requirement.

(Leaflet 1100-PRD-252 is available from Electric Machinery Mfg. Co., Dept. P&PSE, 1331 Tyler Street, Minneapolis 13, Minn.)

Circle 9406 opposite back cover.



NIAGARA SECTIONAL *Aero* HEAT EXCHANGER gives close temperature control, saves you LABOR, Power, Water

- **Because the new design improves the heat transfer to the out-door air by evaporation.**
- **Because new features keep your equipment working for long life with "new plant" efficiency . . . always full capacity.**
- **Because you save 95% of cooling water cost.**

You get faster, more accurate cooling of industrial fluids to specified temperatures.

You improve your quality of production by removing heat at the rate of input.

You save labor in upkeep. With full access to all interior parts and piping you see everything in easy inspections. You head off dirt accumulation and corrosion. Casing panels are removable without moving the coils. The coils can be cleaned from both sides.

First cost is low; freight is low because of the lowest space/weight ratio; you save much labor in erection. Capacity range is 7,000,000 to 18,000,000 Btu/hr. No other heat exchange method gives you so much saving in money and convenience.

Write for Niagara Bulletin No. 132

NIAGARA BLOWER COMPANY
Dept. PL-4, 405 Lexington Ave.
NEW YORK 17, N. Y.
District Engineers in Principal Cities of U. S. and Canada

Circle 9407 opposite back cover.

FOR YOUR CATALOG FILE *Manufacturer's catalogs for your library*

BOILERS & STEAM GENERATION

Two-drum steam generators built to a design pressure of 725 psi are subject of Catalog 55-2. These units are adaptable to any type firing, and the catalog presents sectional drawings of four types. **The Wickes Boiler Co.**

Circle 01 opposite back cover.

Induced draft "Bifurcator" is a direct motor-driven axial flow fan in a divided housing that provides instant draft at starting and adequate draft during boiler operation. Bulletin DB-44, 20 pages, discusses advantages of induced draft, gives construction features of "Bifurcator", shows typical installations, and thoroughly tells with formulas, charts and tables how to select for oil-, gas- and coal-fired boilers. **DeBothezat Fans Division, American Machine and Metals, Inc.**

Circle 02 opposite back cover.

Package steam generators in capacity range from 10,200 to 48,000 lb/hr are subject of 10-page Bulletin PSG-3. Units are available in 175, 250, 375 psig for single or multiple use. Design and construction details are given, with dimensions and weights for various capacities. **Henry Vogt Machine Co.**

Circle 03 opposite back cover.

Refuse and waste stokers are presented in 12-page Bulletin No. 510. Sectional drawings are used to illustrate and describe spreader stokers, with feeders and distributors, to burn refuse fuels either separately, or in conjunction with conventional fuels. Actual installations are pictured. **Detroit Stoker Company.**

Circle 04 opposite back cover.

Glass-protected smokestacks that resist corrosive flue gases are subject of 8-page Bulletin SS-202A. Cost comparisons with conventional type stacks are given. Actual photographs demonstrate ease of installation. Drawings of available sections and accessories are included. **A. O. Smith Corp.**

Circle 06 opposite back cover.

BUILDING MAINTENANCE

Modernizing plant stairs that are worn and slippery is subject of 4-page Brochure M-160. Available lengths and widths of safety treads to fit all steps and landings are given. Easy method of installing on any stair material is illustrated. **Wooster Products, Inc.**

Circle 12 opposite back cover.

ELECTRICAL DISTRIBUTION

Guide to electrical distribution systems is given in 60-page Speedfax catalog which provides fast-reference form for selecting equipment for industrial and commercial systems. Three sections provide extensive information on molded-case circuit breakers, individually enclosed low-voltage power circuit breakers, and engineered substations, transformers and switchgear. **I-T-E Circuit Breaker Co.**

Circle 20 opposite back cover.

For supporting cables and wires, two types of cable trays or tube raceways—the ladder type and the basket small opening type—are fully described and specified in 28-page Catalog 5912. A complete line of fittings and accessories in steel or aluminum is available for speedy installation. **Products Division, The Globe Company.**

Circle 21 opposite back cover.

EQUIPMENT MAINTENANCE

For testing electrical insulation, dielectric test sets supply and measure DC voltage up to 100kv and output current up to 20 ma. Sixteen-page Bulletin 22 tells how to use and describes two models for non-destructive tests on electrical insulating materials, individual insulation structures and insulation of electrical equipment like cable, rotating machinery, dry-type transformers and switchgear, capacitors, resistors and communication equipment. **James G. Biddle Co.**

Circle 30 opposite back cover.

Portable high-current test instruments for testing and calibrating take the guesswork out of electrical protection of motor starter overload relays, circuit breakers, fuse links, meters, current transformers, and oil circuit reclosers. Four-page Bulletin #356 discusses the use of these instruments. **Multi-Amp Division, Multi-Amp Electronic Corp.**

Circle 32 opposite back cover.

Nondestructive field testing service is explained in 4-page brochure. A suggested list of equipment needing testing is given, with illustrations of typical in-plant inspections. Magnetic particle, fluorescent magnetic particle, ultrasonic "sounding", and fluorescent penetrant test systems are described. Locations of field service offices are given. **Magnaflux Corporation.**

Circle 33 opposite back cover.

All kinds of electrical testing equipment is listed in general catalog containing specification sheets and bulletins on each instrument. Equipment of interest include those for testing resistance and measuring dielectric strength of insulation in circuits, panels, motors, switches, circuit breakers, cable and wiring. **Associated Research Inc.**

Circle 34 opposite back cover.

FANS & BLOWERS

Engineering data on roof ventilators are presented in 16-page bulletin A-112C. Section is devoted to fans used in these units, and descriptions of six types of ventilators follow. Two pages of tables give air-delivery rates for all models. **Hartzell Propeller Fan Co.**

Circle 41 opposite back cover.

INSTRUMENTS & CONTROL

Self-powered temperature regulators use no compressed air or electricity. Bulletin No. 620-2, 10 pages, describes line of these controllers available in a wide variety of materials of construction. Three pages are devoted to "how to size." **Sarco Company, Inc.**

Circle 49 opposite back cover.

To obtain your copy of catalogs described in this section, circle corresponding numbers in section listed under "Catalogs" on the Reader Service Card opposite back cover.

You name it and this 56-page catalog describes an automatic control to safeguard it. Catalog 860 lists over 200 products consisting of pressure, temperature, liquid level controls, relays, and mercury switches. Applications include something for practically every plant and power services operation. **The Mercoid Corporation.**

Circle 48 opposite back cover.

No matter what the speed, there's a tachometer described in 20-page bulletin 35 to measure it. A wide selection of ranges and sizes are available in 15 models. In the descriptions of many models, actual-size dial faces are pictured. Descriptions of accessories and a tester are included. **James G. Biddle Co.**

Circle 51 opposite back cover.

Direct-operated solenoid valves for automatic or remote flow control of liquids and steam up to 400°F is subject of 12-page bulletin V-6. Six types are illustrated and described. Accessories and capacity tables are also presented. **The Johnson Corp.**

Circle 53 opposite back cover.

Reliable protection of machinery where stopping or slowdown may cause damage is provided by this device which indicates stopping or drop in speed. Four-page bulletin RG-21 specifies and describes installation of this low-cost protection device. **The Bin-Dicator Company.**

Circle 54 opposite back cover.

INSULATION, THERMAL

How to make insulation effective through use of mastics, adhesives, coatings, and flashings is fully described in general catalog. Properties and directions on how to use (in step-by-step illustrated descriptions) are given on over-a-hundred products for commercial, power, process, cold storage and marine applications. **Benjamin Foster Company.**

Circle 60 opposite back cover.

Special long-fiber asbestos makes it exceptionally suitable as an insulation material. Called Amosite, it is subject of 40-page "Unibestos" pipe insulation catalog. Besides giving all the properties of this material, catalog also has sections on "How to Select Insulation" and "Selecting the 'J' Factor." **Union Asbestos & Rubber Company.**

Circle 62 opposite back cover.

All kinds of insulation products are described and specified in product catalog IN244-A, 54 pages. The booklet is divided into sections according to application (industrial and high temperature; plumbing, heating & air conditioning; refrigeration; fire brick and refractories; finishing and weatherproofing; and miscellaneous). Specifications on each product for these applications are given in easy-to-read form. **Johns-Manville Corporation.**

Circle 64 opposite back cover.

LUBRICATION

How do you want to oil it? Catalog number 10 with 34 pages lists a variety of lubrication equipment for handling a multitude of oiling jobs. Photographs, drawings, specification tables and descriptive paragraphs round out the data on a line of oil cups, oiling systems, dispensers, valves and flow indicators, oil gages and filters, and chain oilers. **Oil-Rite Corporation.**

Circle 70 opposite back cover.

MANAGEMENT & ENGINEERING

For supporting castable linings in cyclones, hoppers, pipelines, flues, furnaces and stacks, a cellular steel mesh of hexagonal design prevents lining slump and retards erosion, cracking, blistering, pitting or collapse. The product can be used to support concrete floors subjected to heavy traffic. Two "Grid-steel" catalogs fully describe two types of this steel framework. **Irving Subway Grating Co., Inc.**

Circle 31 opposite back cover.

Custom fabrication of sheet metals, plates and light structurals is the job of this manufacturer. Bulletin No. F4, 38 pages, shows facilities and a variety of equipment fabricated there. Equipment shown includes: ducts, turbine lagging, insulation jacketing, special hoppers, intake louvers, electrical enclosures, instrument cubicles, machine guards, motor and pump bases, concrete forms, tanks, and heat exchangers. **The Kirk & Blum Manufacturing Co.**

Circle 75 opposite back cover.

PIPING, VALVES & SPECIALTIES

Metal hose connectors in carbon steel and stainless steel are shown in 8-page Catalog 539. Suggested applications are listed. Charts give installation data for each pipe size and length of connector and nipple. Available models in each material are illustrated. **Cobra Metal Hose.**

Circle 83 opposite back cover.

Traps, separators, strainers are covered in 4-page Bulletin 811. Entrainment and line separators, and exhaust leaks are shown. Several types of traps are described, including a unique combination float and thermostatic trap that discharges below saturation temperatures. Selection and capacity charts for steam, air, and hot condensate are included. **Wright-Austin Company.**

Circle 84 opposite back cover.

POWER TRANSMISSION, MECHANICAL

V-belt drives offering extreme compactness and reductions in cost are described in 40-page Bulletin A69-5A. Contains data and tables for selection and operation of standard drives; also for designing and operating special drives. Horsepower ratings, service level tables, and specifications for belts and sheaves are given. **Dodge Mfg. Corp.**

Circle 90 opposite back cover.

WATER SUPPLY & TREATMENT

Over 40 test sets for making water analyses are described in two water testing equipment bulletins. One bulletin lists all the sets, telling which equipment and chemicals it contains. The other tells how and why it is necessary to run the various tests. **The Bird-Archer Co.**

Circle 96 opposite back cover.

Accurate salt inventory in underground brine tanks is possible with "Levetrol" system. Eight-page bulletin fully describes the system and tells how it controls the liquid level automatically and in proportion to salt consumed. **Morton Salt Co.**

Circle 99 opposite back cover.

To obtain your copy of catalogs described in this section, circle corresponding numbers in section listed under "Catalogs" on the Reader Service Card opposite back cover.

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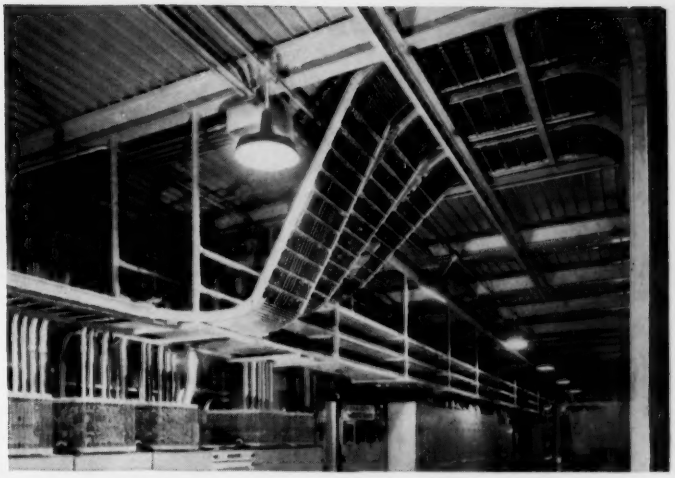
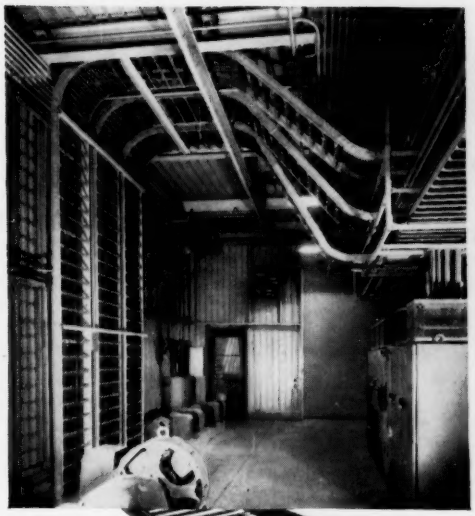
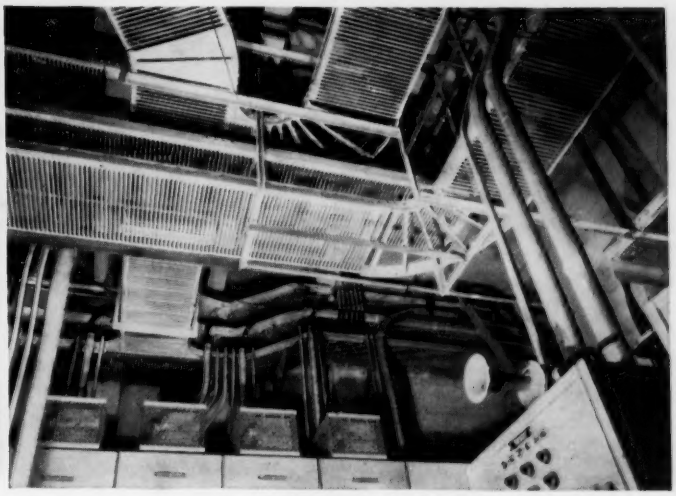
how INLAND STEEL uses GLOBE INTERCHANGEABLE TRAYS to support cables in their Indiana Harbor Plant

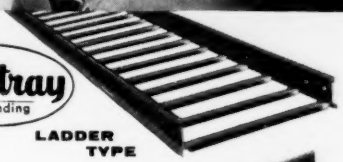


★ Engineered for Uniform Design and Easy Installation
★ Steel or Aluminum Construction
★ Complete Accessories for SPEEDIER Installation
★ Complete Interchangeability
★ No Sharp Edges to Damage Cables

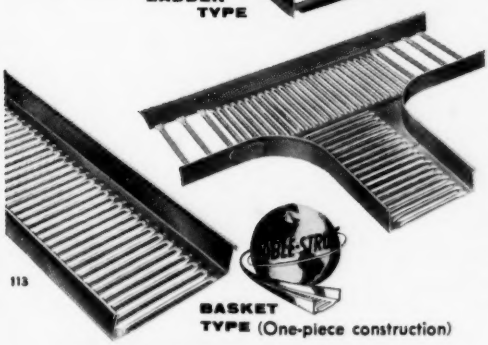




Globetray
Pat. Pending



LADDER TYPE



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BASKET TYPE (One-piece construction)

Globe's two types of cable trays, one a ladder type and the other a basket type, to support cables, wiring and tubing have become increasingly popular because they can be used INTERCHANGEABLY at any given location depending on the type and weight of the cables to be suspended. The advantages of each type tray can be used to the fullest. Globetray, the ladder type, is intended for use where festooning is not a problem, while Cable-Strut, the basket type, is used for the support of communication wire, instrument tubing and control cables in automation applications.

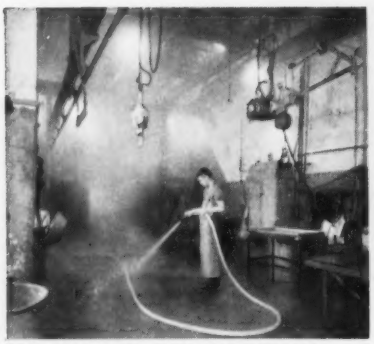
These two cable trays have been thoroughly field tested in hundreds of large industrial installations, in new plant construction, in power plants and for power distribution in all types of manufacturing processes. Send for FREE catalog giving full information and installation techniques.

PRODUCTS DIVISION
THE GLOBE COMPANY Manufacturers since 1914
4036 S. Princeton Ave., Chicago 9, Ill.

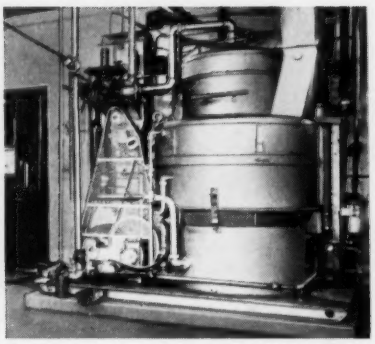
Representatives in all principal cities . . . consult the yellow pages in your phone book under "Conduits" for the one nearest you.

For more information, circle 9408 opposite back cover.

3 BOILERS IN 1 COMPACT PACKAGE!



FOR ORDINARY STEAM REQUIREMENTS: The cycle-type Modulātic standard unit furnishes 90% dry steam for most ordinary needs such as cooking, heating water, drying, cleaning, etc.



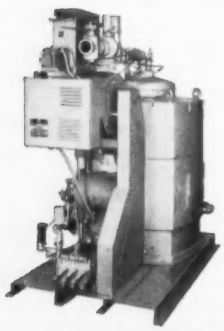
WHERE DRY STEAM IS REQUIRED: The Modulātic may be used with an optional steam separator, for over 99% dry steam for heating, moulding, forges, operation of power equipment, etc.

IF CONSTANT STEAM LOAD MUST BE MAINTAINED: For applications where even a nominal drop in pressure cannot be allowed, an optional steam reservoir may be added to provide a "cushion" during an off cycle.

VAPOR MODULĀTIC

WATER TUBE BOILERS

¼ the size and weight of conventional boilers... largest size (150 BHP) uses only 5′ X 8′ space



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